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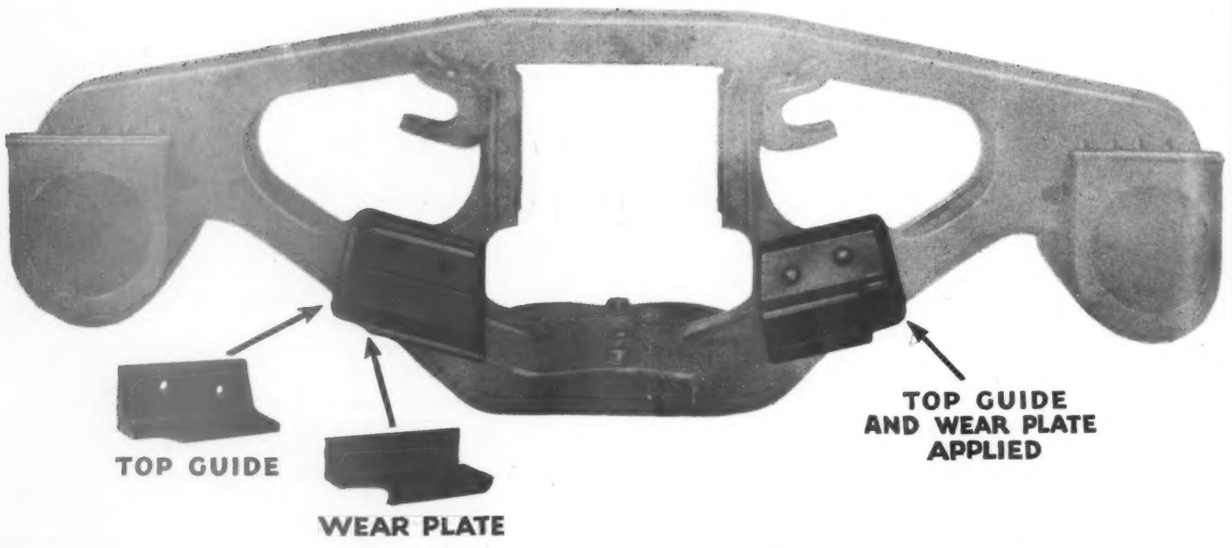

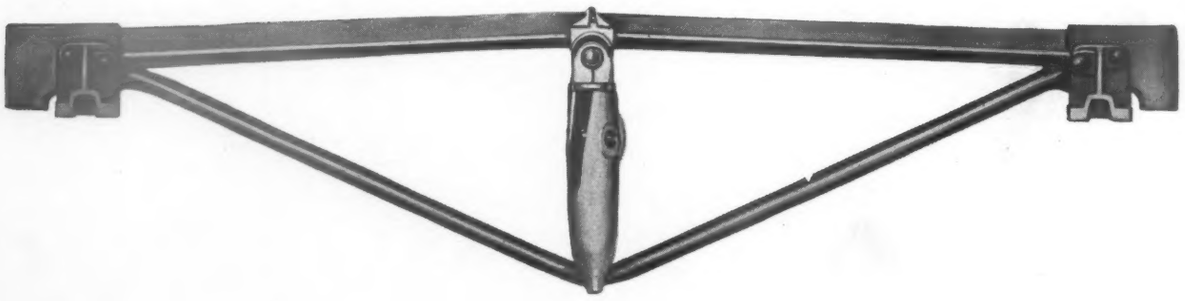

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JULY, 1942

A. S. M. E. Cleveland Meeting:

Conservation, Substitution, Reclamation 287
Eastman Urges No Letdown Now Nor After the War 288
Stevenson Optimistic As to Materials for Maintenance 289
Three Hundred Panama Canals in One Year 291
Conserve New Material Supplies Regardless of Cost.. 293
The Kaleidoscope of Material Substitution 296
The Reclamation Plant— A Dependable Source of Material 299
Discussion 302

Editorials:

Keep the Cars Moving 303
A Challenge of Total War 303
Is the Risk A Reasonable One? 304
War Production In Railroad Shops 305
New Books 305

Car Foremen and Inspectors:

Great Northern Car Shop Devices 306
Speedy Operating Spur-Geared Chain Hoist 311
Reclamation of Air-Brake Hose 312
Packing Retainer Spring 313
Air Brake Questions and Answers 313

Backshop and Enginehouse:

Keep Them Running by Walt Wyre 315
Questions and Answers On Welding Practices 317
Safety Solvent Replaces Naphtha, Gasoline, Kerosene.. 318
Sedalia Locomotive Shop Kinks 318
Cooler, Faster Cutting With High Sulphur Oil 320
Disston Conservation Control Plan 320
Locomotive Boiler Questions and Answers 320
Power Jacks for Railroad Use 321
Individual Transmissions for Machine Tools 321

High Spots in Railway Affairs 322

News 323

Index to Advertisers ..... (Adv. Sec.) 64

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Conservation, Substitution, Reclamation

Under these titles the materials problems of the railroads were thoroughly canvassed at semi-annual meeting of the American Society of Mechanical Engineers at Cleveland on June 10—Addresses by Eastman and Stevenson—About 250 railway and supply men in attendance

THE problems of the railroads with respect to materials needed for the maintenance of track as well as of cars and locomotives were discussed at the railroad sessions of the semi-annual meeting of the American Society of Mechanical Engineers held at the Hotel Statler, Cleveland, Ohio, June 8 to 10, inclusive, in a program dealing specifically with conservation, substitution and reclamation. The railroad program, which was sponsored by the Railroad Division of the society, occupied both morning and afternoon sessions on Wednesday, June 10. Following the morning session luncheon was served for all those attending. The registration indicated that about 250 persons were present.

Three Addresses and Three Papers

In addition to the three papers, one on each of the above subjects, there were addresses by Joseph B. Eastman, director, Office of Defense Transportation, and by Andrew Stevenson, chief, Transportation Equipment Branch, War Production Board. Following Mr. Eastman's address in the morning, Col. James L. Walsh, chairman, War Production Committee, A.S.M.E., delivered a short address on the subjects of logistics in which he drew a vivid picture of the task facing the United States in the present war and emphasized the tremendous importance of transportation both within the United States and between the United States and the various zones of military combat throughout the world. He pointed out specifically some directions in which engineers can be of assistance, particularly in reducing the demands on both ships and land transportation facilities.

The paper on conservation was prepared by A. G. Hoppe, assistant to the mechanical assistant to the chief operating officer, Chicago, Milwaukee, St. Paul & Pacific, who suggested, among other things, a return to a more intensive use of the forge shop to reduce the amount of material removed in the machine shop. C. B. Bryant, engineer tests, Southern, in his paper on substitution reviewed the Mechanical Division program looking toward the development of substitutes for copper and tin. G. A. Goerner, general storekeeper, Chicago, Burlington & Quincy, presented a reappraisal of the problems of reclamation in the light of the new emergency conditions. Taken together, the three papers presented a striking picture of swift adaptation to the sudden curtailments of customary supplies of materials and changes in habits with respect to the use—and misuse—of materials in which the exercise of ingenuity by the industry as a whole on an organized basis, as well as by individuals, has been outstanding.

The program was developed by the Meetings and Papers Committee of the Railroad Division, of which W. M. Sheehan, assistant vice-president, sales, General Steel Castings Corporation, is chairman. In addition to the formal addresses, the chairman called on James W. Parker, president of the society, and on Roy V. Wright, editor, *Railway Mechanical Engineer*, for brief talks during the course of the meeting.

Both sessions were presided over by D. S. Ellis, chief mechanical officer, Chesapeake & Ohio, the chairman of the Executive Committee of the Railroad Division. At

the morning session he called upon G. D. Brooke, president, Chesapeake & Ohio, to introduce Mr. Eastman. At the afternoon session he called upon W. E. Woodruff; president, Erie, to introduce Mr. Stevenson.

General discussions followed the formal presentations of the papers at both the morning and afternoon sessions. Summaries of the addresses and abstracts of the papers follow.

Eastman Urges No Letdown Now Or After the War

Railroads are the backbone of transportation—Existing high standard of performance must be maintained—Competition after the war will be great

"THE railroads are now the backbone of the transportation industry without any question. I think they will remain so, but it is going to be necessary for the managements to keep on their toes, to keep the fires of imagination and creative ability blazing all the time if they are going to keep up with the procession." With these words in his A. S. M. E. address, Joseph B. Eastman, director, Office of Defense Transportation, expressed his appraisal of the future of transportation. Mr. Eastman commented upon the governmental assistance which had been given the aeronautical industry in the development of testing laboratories and stated that he had tried, in his earlier assignment as coordinator, to further a plan for a centralized scientific engineering research department covering equipment design and operating problems in the railroad field.

Recalling that this plan, which was recommended by outstanding industrialists as well as railway operating officers, had not been carried out, Mr. Eastman suggested that, in view of the tremendous amounts of money being spent in one way or another by the government on the air-carrier industry, water-carrier industry, motor-carrier industry, the government might be willing to devote a little money to experimentation to enable the railroads to have a place where their equipment and facilities can be tested. He said that he looked forward to the time when steam locomotives will not be made to order and when a higher degree of standardization will be attained in car construction, and even in track equipment construction; when the claims of "super-salesmen" would be tested in the laboratory, as are the products entering into the construction of airplanes.

Record of Railroads Excellent Up to Date

"Up to date the railroads have an excellent performance record to their credit," said Mr. Eastman. "They started in 1939 when the emergency began with the invasion of Poland. They had planned for this emergency, largely as a result of what happened during the last war. They had a centralized department in the Car Service Division of the Association of American Railroads. In addition to that they had established an effective liaison for cooperation with the shippers through the Regional Advisory Boards. They also had the benefit of the Bureau of Service of the Interstate Commerce Commission."

"In 1941 the railroads carried more ton-miles than ever before in their history and they did it with about one-third fewer cars than they had in 1929. It has been an excellent performance and, so far, there has been no congestion of any importance. Whatever the railroads have been called upon to do, whether it was movement of munitions or raw materials, or of troops and impedimenta, it has been done well."

The diversion of freight formerly handled by water carriers, including transcontinental traffic and petroleum movements to the eastern seaboard, coal shipments to New England, former Great Lakes traffic, and added rail hauls of freight from South Atlantic ports that formerly arrived at eastern ports, impose great strains upon motive power as well as the rolling equipment of railroads, said Mr. Eastman. He pointed out that because of the longer hauls involved in connection with so much of the freight moving today that carloadings, formerly the standard index, should be replaced by freight ton-miles in measuring traffic volume. At the present time ton-miles are increasing at a rate more than double the rate of carloadings. One thing which helped greatly in preventing car shortages, he said, was the effect of General Order No. 1 which led to heavier loading in l.c.l. cars. More of this type of traffic is now handled, using 40 per cent fewer cars, than was handled in 1941.

How About New Cars and Locomotives?

Expressing his belief there might be an additional increase in the traffic load that rail carriers must handle because no more trucks are being built and the rubber shortage may force existing trucks off the highways, Mr. Eastman pointed out that additional problems will arise in the demand for more railroad equipment. "We might look forward to these strains upon the railroad service with equanimity, were it possible to get cars and locomotives without any difficulty," he said. "But that is not the situation. They have to be built out of steel and other critical war materials, and the demand for these critical materials is greater than our present supply because of the immense war production program which embraces not only the armaments, munitions of war, naval vessels, but also the tremendous flotillas of ships which are being built to carry these things across to where they can be used, and also the synthetic rubber plants which have to be built to take the place of thousands of square miles of rubber plantations which are in the hands of the enemy.

"On account of all those demands upon critical materials," he continued, "the War Production Board naturally is disposed to look with reluctance on allotting steel for the construction of cars and locomotives. They haven't allotted as much steel for that purpose as I wish they had. They are relying in that connection upon what they believe to be the capacity of the railroad industry, and I mean by capacity its mental capacity, and upon its reserve strength and ability to take up slack.

"That is a challenge to the railroad industry and I know that the railroad industry will do everything in its power to meet it. A great deal depends upon the imagination of the mechanical engineers, on their powers of improvisation and ability to act quickly."

Maintenance Material Vital

"Two things I should like to mention, particularly," Mr. Eastman said. "I asked Phillip Hollar, head of my section on materials and equipment, if there was anything he would like to have me say to you and he said, 'I wish you would call their attention to the field of scrap.' I said, 'I thought that field had been combed over again and again in the last two years, and the railroads had collected all the scrap there was.' He said, 'I think there is still some you can find around the shops, for instance old rails which you find used for steel posts and enclosures.' He said, 'If they look carefully over the situation in all the shops, they will still find quite a little scrap which it is possible to reclaim.'

"The other thing to which I want to call your particular attention is the question of maintenance. One reason why the railroads have done as well as they have done—and that has been excellent so far—is because they have been able to keep their equipment in good repair. They have reduced the percentage of bad-order cars and locomotives down to the lowest percentage on record. They have got to keep that up, in view of the fact that they are not going to have an abundance of new locomotives and cars, if they are going to maintain their performance. That makes the maintenance question of supreme importance.

"I was considerably worried when I heard that there was a possibility that the War Production Board might in the latter part of this year shut down the supply of maintenance materials in whole or in part. I hope you will watch that matter very closely, and if you see any danger in sight, let us know in Washington at once. I can't conceive of anything that is more critical and more important than keeping this equipment that the railroads have in topnotch condition. Of course, you ought to use all the devices you can through reclamation and substitution and conservation to make the supplies you have go as far as possible."

Mr. Eastman called attention to the fact that there seemed to be an increasingly unfavorable ratio between railroad accidents as compared with traffic increases. He indicated that, with respect to older classes of tank cars and other equipment, he was concerned with respect to their ability to stand up under the strain of their present intensive utilization, and asked that his office be kept informed of "signs that point to danger ahead."

Post-war Competition Will Be Great

Speaking of the problems of post-war competition at the conclusion of his speech, Mr. Eastman said, "I recall a famous character who, speaking of his enemies, said: 'If you can't lick them, join them.' And that might be something to think of in connection with the motor carriers and the air carriers. Already you can use the motor truck to great advantage in railroad operations. It is being used extensively, and you may be able to do more. You may be able to do it in the case of the airplane as well. In the meantime, I know that the railroads are going to work with the shippers, and with each other, and with other forms of carriers, and with the government to keep everything rolling to the utter confusion and defeat of our enemies."

Stevenson Optimistic As to Materials for Maintenance

The fact that the armed services need the same things that the railroads do intensifies the problem — Substitutes are being developed

In making the comment that "As far as we can tell, there is no reasom why, in the third quarter we should not receive all of the material that is being requested for maintenance," Andrew Stevenson, chief, Transportation Equipment Branch, War Production Board, in his A.S.M.E. address, offered an answer to a question that has been of serious concern to those who are charged with the responsibility for maintaining equipment. The comment, however, carried a word of caution when, in continuing, he said, "But while we will get material for maintenance, it doesn't mean necessarily that we will be able to be wasteful or profligate or have too many A-and-B items out of our maintenance account."

In the first part of his talk on the materials question Mr. Stevenson commented on the rapid changes that have taken place which have of necessity had an important influence on the policies and decisions of the O.P.M. and the War Production Board during the past seven months. Before war was declared, in December, the problem was materials and the development of methods to assure that they would be used where the need was the greatest. Priorities was the problem of early December. With the outbreak of the war, however, the second aspect, not materials but want of production, arose and caused the organization of W.P.B. The emphasis, since the middle of May, has again swung back to materials. "So good a job has been done" said Mr. Stevenson, "that we are confronted again today with an even more severe and tight situation for materials needed to keep converted plants going in the production of war goods.

"So it is on that basis that public announcement has been made that we would postpone, if not refrain entirely from building certain contemplated plant expansions. It is on that basis in part that certain conversions of plants are temporarily deferred. True, here and there, and especially I think in the case of railroad shops, as a result of our agreement on May 11, there are certain machine tools from which we need to obtain machine-tool hours.

"But by and large I think the problem now is one of getting sufficient materials to keep what we already have in war production running at full speed. This is evident more particularly in the railroad industry because this industry competes with the military effort probably more severely than any other industry. Copper, rubber, iron and steel—not only the over-all materials, but particular items like plates, shapes, bars, castings—are essential to the military effort, and they are items that we take in great quantities.

"As a consequence, this increased tightness of materials we felt in our work, and are feeling, and will feel more severely. It is on this shortage of materials, I think, that we can describe the closing down of the new freight-

car and passenger-car construction. Two hundred thousand tons of steel per month simply cannot be spared to build freight cars. It's on this basis that we have L41, the construction order, with which the War Production Board is seeking to curtail the amount of construction.

How Tightness Affects Maintenance

"Now with the tightness of materials, we are worried about maintenance. I think that I have sufficiently outlined for you the locomotive situation, which is one of production; the car is one of tightness of materials; but maintenance is our chief problem. In this particular, the railroads have done an especially good job, and this last week, as we have gone over the new 351 form which is filed under P88, we have been particularly pleased to see the manner in which the various engineers, together with the purchasing agents, have recognized the situation and are asking for what they feel they need to get along, but not necessarily need to build up additional inventory.

"As far as we can tell, there is no reason why in the third quarter we should not receive all of the material that is being requested for maintenance. That is as far as I can judge from these 351's. But while we will get material for maintenance, it doesn't mean necessarily that we will be able to be wasteful or profligate or have too many A-and-B items out of our maintenance account.

"We have several especially tight spots. You all know the announced shipbuilding program of 8,000,000 tons this year, and we hope to have more. You know the announced program of about double that next year. Now you know what that means in terms of plate. As a consequence, realizing that the plate situation would be far tighter, we have asked that you go over to composite cars, so that the plate on hand, regardless of the fact that it might be used in completing cars under the present design, might be saved for necessary repairs. I appreciate that there is some adjustment which has to be made in that case.

"We have also asked in that particular that we go over to narrow plate, insofar as possible, on locomotives and also in locomotive repairs. To the extent that we can free these wide plate mills from our demands, and others, we will be successful, I think, in receiving the plate that we need for absolutely necessary maintenance.

"We must face the fact, however, that, in the light of this shipbuilding program and in part the tank program, we will not get all the plate we need for a heavy repair or rebuilding program. I am reluctant to bring it up, but I think we might as well appreciate that we may be confronted with this dreadful word 'patching.'

"Now again, in the matter of plate, I believe the railroads have assisted us a great deal, and shown splendid cooperation, especially in this tank-car plate, which Mr. Hawthorne informed me this noon had now been approved, which is the use of thinner gauge for special tank cars which are not contemplated to last the equivalent life time of our heavier plate.

"Shapes too are involved in shipbuilding. And as we have started to build a few plants, especially in the case of rubber, that have been too long delayed, the ratio between plates and shapes, narrows. We use more shapes per ton of plate than we do in the case of ships. As a consequence, the shape situation has been unusually acute, and this month we have deferred some 36,000 tons of rail to July, in order that we may roll shapes on the rail mills.

"Castings also have been tight. One week plate is the worse thing, and the next week it's shapes, and the following week it's castings, and the next week it's plates again. We never really know when we have one thing licked for good. As a matter of fact, we can't expect it. I think, however, the casting situation should ease, especially in view of the decreased freight-car building program.

"On rail, the material situation has not yet shaped up to the acuteness that we will not get our 1,260,000 tons. However, that is conditioned on the release of relay rail. In that again, I wish to express my appreciation here for what has been done in the case of taking shorter joint bar. The use of the 24-in. bar which goes into effect shortly will relieve us on tonnage that we vitally need. That should be followed up in the matter of tie plates and frogs.

"Lumber, too, right now is tight; we are taking about a quarter of our year's output to build certain army camps. That should ease in maybe 60 or 90 days. But copper and nickel are the worst of all of them.

"What has been done on journal brasses following our discussion last December, has probably been one of the most significant things in indicating to the Board the cooperation that the railroads have given and are continuing to give in the conservation of materials.

"Now I am delighted that Mr. Pearce, as he has expressed to me today, feels that we now have one that will take the railroads out of the primary copper market for sometime.

The Purpose of Standardization

"In standardization which we discussed before, we were concerned on two counts, one on locomotives, and one on cars. The reason in looking toward standardization of freight-car design last December and January, was that, when the closing down of freight-car production came, which we knew was coming, we could balance up the inventories.

"Unfortunately we did not quite reach that standardization picture as far as the cars that were under construction last April were concerned. However, owing to the splendid efforts of Mr. Hawthorne, Mr. Irving, and others, at a meeting that we had some two weeks ago, I believe we have been able successfully to take care of most of the inventory.

"In locomotives we are looking toward standardization in a loose sense—the use only of designs that previously had been employed. We are looking toward that type of freezing of design with the idea of production. There have been some departures by the railroads and the builders from those designs, but we intend to insist on them.

"The locomotive picture has always been one of concern to the Transportation Branch. As a matter of fact I think we were a 'voice crying in the wilderness' as far back as the Advisory Commission days in the matter of power, feeling that as the material situation became tighter and a choice had to be made between cars and locomotives, that we would take the locomotives. We are hopeful that we can build these locomotives this year. It is going to call for exceedingly fine co-operation between the builders and the suppliers and it is going to call for very active participation of the mechanical departments of the railroads, in some cases to build locomotives, in some cases to assemble them, and certainly, in many cases, to manufacture parts for the locomotives if we are going to come anywhere near meeting our domestic and foreign program.

"In the production of these locomotives I hope we can

continue to carry out our various agreements, and understandings on the elimination of a number of specialties. They are not only causing us concern, production-wise, but more particularly in the matter of the materials consumed.

Tighter Materials Require Tighter Controls

"The material situation is getting tighter. Therefore the material controls must be tighter. About that I am sorry and disappointed, because I would like to see the least amount of reporting possible to Washington. Preference ratings, as such, as you well know, are only permissive and simply give a man a certain rating, saying that he comes behind somebody else in the securing of new material. Our allocations are different. They supposedly guarantee a certain amount of material.

"The same way on railroad maintenance, and under the materials used by the railroads, we are giving 50 per cent A1-C, and 50 per cent A1-J. But when we come down to an actual allocation as such, we must know not only what we need, and what we are using, but where that particular material is coming from, insofar as it is taken from some other industry.

"As a consequence the War Production Board has gone over to a reporting G275 form and a PD25A, and has issued a new regulation No. 10 in which all industries are given a number, and all purchasers must place this number on their orders, and the order be carried on down through every supplier.

"To some degree, our 351 under the P88 preference-rating order that railroads have, is excluded from this overall materials control, which every other industry must follow, but our form is the same except for certain changes that we feel we need for our industry.

"I mention this last point because I hope that you engineers will appreciate that the life of a purchasing agent is not easy. He comes to Washington and talks with our men, and perhaps comes back and disappoints you very greatly in that he doesn't have certain material. But I hope that you will help him by cutting down on some of those requests at the source, and by watching insofar as you can, the total amount of material you ask for, as well as the specific kinds. I urge that not especially because I think there has been a laxity in the matter up to now, because I think we have had excellent assistance and co-operation on the matter, but because of the purchasing agents who walk out of our place saying, 'I don't know how I'll explain that back home.'

"There was a time when I knew that certain items that we were not getting, were going to industries that I thought were not very essential. At that time we never let up for an instant in trying to get even more than the railroads had asked for. But we know now where these materials are going, and we know especially in the railroad items how directly competitive they are with military necessities, both in army and the navy equipment.

"So I think that all of us should get together without regard to whether our department, or the purchasing agent's department, is charged with the responsibility of conserving materials, or whether it is the practice to clear through the President's office before going to the W. P. B., and see that we are saving on materials."

"Three Hundred Panama Canals in One Year"

Thus the speaker described the war production task — Engineers can save transportation by designing for light weight and reducing bulk

By Col. James L. Walsh

Chairman, War Production Committee, American Society of Mechanical Engineers

You have heard the expression recently that this is a quartermaster's war. I suppose that the word "quartermaster" was used largely in a sense of supply because the quartermaster doesn't have to do with all kinds of supplies any more. He doesn't even have to do with moving all kinds of supplies as he did until recently. The movement of supplies has become so very important that an entirely new corps has been established in the army called the Transportation Corps.

The Magnitude of Our Job

With the recent request by the President for an additional 39 billion dollars for the fiscal year which begins in a few days, it would indicate that during the next 12 months, beginning July 1, there will be an activity of one kind or another related to the war, represented by a total of 110 billion dollars. The Panama Canal took 10 years to build. Roughly, what we are tackling beginning July 1 is a job equivalent to the building of 300 Panama Canals in one year; that's not very far from one a day. The Empire State Building is 102 stories high. It's equivalent to building 2,200 Empire State Buildings in a single year!

That's just the overall measurement, just taking money as the least common denominator to show what we are facing, the first of July; what Mr. Eastman is facing, utilizing all the transportation available. And if you think it's going to be easy to do that, you're going to be very sadly mistaken. It can be licked, but it's not going to be licked by letting Eastman do it. It's going to be licked because you and I, wherever we happen to be, lend a hand in licking it.

Ships — And More Ships!

One thing we ought to bear in mind as a very essential factor in this situation is that eventually we will have to lick the Japs, no matter what we do first. To lick them, we have got a seaborn line that will average 12,000 miles. At present, the Japs have a seaborn line of communication of around 1,500 miles. That, if my arithmetic serves me rightly, is a ratio of 8 to 1. The number of ships required is determined by the relative length of the lines of communication. So, roughly, we have got to outbuild the Japs 8 for 1, in order to get an even break.

You can read the papers of the number of ships we

are launching, and the number of ships that the Germans are sinking. I won't go into the exact details on that, but there certainly isn't very much net gain. In fact in some weeks there has been a definite loss; they are sinking more ships than we are able to launch. On top of that, they are building submarines faster than we are sinking submarines.

These things may have little to do with the railroad industry, but it seems to me if you get a proper background of this situation, you can get the feel of the things that are coming, the load that is going to be on the neck of the railroad industry, because that, at present, is the only industry that we can count on logistically—moving materials to the fighting fronts.

Modern Concept of Logistics

I looked up this word "logistics" and it said in one dictionary, "the science of supplying armed forces in the field." I think that is about as up-to-date as saying that war is a duel between professional armies. To the civilians that have been killed all over the world, certainly that is not their understanding of war, as a duel between professional armies. That is no longer the case.

War nowadays is between entire nations with every soul in them, and groups of nations. It covers every individual man, woman and child from the maternity hospital to the verge of the grave. It catches the churches, and the schools, and the homes, as well as the factories and the forts. We are all in it, in the army now. We are all targets, as a matter of fact.

Due to the fact that transportation is necessary, that food and other equipment is necessary to maintain the civilian populations of the United Nations in order to keep them in the war on our side, that is also a military function. So that eventually we come down to the conclusion—it seems to me it is inescapable—that we are facing for survival one single completely integrated, highly complicated problem in logistics, to keep the United Nations and their civilian populations alive; to keep their forces in the fight until we can arm, equip and transport armed forces to where they can be effective.

That leads to another thought. There isn't one thing that we do from the time we get up in the morning until we go to bed at night, not any of us, but has its effect either for plus or minus on the outcome of the war. Figure these things through, and see their effect.

You take the sugar in your coffee as an example. We Americans are prone to put a spoonful in, and put a little more in; down goes the coffee, then look in the cup, and half the sugar is still in there. What effect has that on the war? It would take a fifth of an acre of sugarcane to produce the alcohol necessary to produce the powder to fire a single round in the jungle, perhaps in Corregidor. That's the interconnection between these events. That's the thing we can do.

Here we are in a hotel. They put plenty of nice towels around, and we use one, and throw it aside; and then we use another one, and throw that aside. It's all included in the price. And we leave a few lights on. There's not enough chlorine available today even to experiment with making decontaminants against mustard gas. And this chlorine can come only out of things like either the purification of water supply or the bleaches the laundry and textile people use.

We need that chlorine, so just as a tip for the future, don't be too careless with your towels, either at home or in the hotel. They are all interconnected, every one of them, and I think you've got the sense to see that interconnection.

Cut Down the Bulk

Now, why am I talking about this? I want you to help Joe Eastman. You can help him in your design, your material, your apparatus, your machines. You engineers can help by designing nearer to a factor of safety of unity, as we have to do in the army, in order to cut down on weight. Why do we engineers use factors of safety of three, four or five if it is not necessary—just mental laziness? We are in a serious situation now in which we can no more afford to over-estimate than we can to under-estimate. Take the small matter of packages. The forest products laboratories in Wisconsin developed a crate for shipping automotive engines abroad, and they cut down the bulk by 15 or 16 per cent. Now what does that mean in the logistic sense? It means that out there in Wisconsin they were building ships, didn't it? They cut down the bulk so that five ships would do the work of six, bulk being the determining factor. Do you know of any quicker way to build ships? Do you know of any way to pay for them more easily than not to have to have them to do the same job?

Now there are plenty of those things right under our noses. We have been criminally wasteful, and we are going to pay for it, not with money, maybe, but with our lives.

War nowadays is between entire nations with every soul in them, and groups of nations. It covers every individual man, woman and child from the maternity hospital to the verge of the grave. It catches the churches, and the schools, and the homes, as well as the factories and the forts. We are all in it, in the army now. We are all targets, as a matter of fact.

Be Safe and Save Transportation

Even children have got to get the sense that everything they do and don't do has an effect on the war. Little Willie leaves his roller skates on the front walk. Tell him he's helping Hitler. The mailman or somebody else comes along and falls and konks his head. First you telephone, and waste communication, of which we haven't enough. And you've got to have a doctor attend to him. We haven't got enough doctors today. Fundamentally the reason Willie is helping Hitler is because you have to get an ambulance to haul the man to the hospital. You have to use surgical tools, perhaps, and we don't have enough chromium to plate them. And we can't afford to use the rubber and the tires and the ambulance to cart anybody away.

If you think that is a small item, let's just figure it up.

Traffic deaths in any nineteen-month period—you can take back up to this last month—show around 40,000 killed by automobiles. We killed only 39,000 in 19 months of the World War by bayonet, bomb, shrapnel, and everything else. The automobile has been killing off regularly, month after month, the same high average we lost during the World War. We can afford to do without that sort of thing.

But even in your own home, at the same time we are losing 40,000 on the highways, we are losing 102,000 needlessly at home—people slipping on the soap in the bathtub, or on the milk bottle on the back stairs. You can't afford that kind of luxury any more, and why? Because it absorbs transportation. That's the fundamental reason, that transportation is needed to support the boys wherever they may be. You know it just as well as I do, and every mile they go, it takes more and more transportation to supply them.

A War on Weight

So, you engineers, focus on a war on weight in the design of apparatus, gadgets, and so forth; cut down the bulk of your packages; cut down anything.

In 1935 they started building some standard freight cars that were six tons less in weight than the usual design. What would that have meant today if it had been followed through? Six tons per car unnecessarily lugged over the Continental Divide, 85 cars to the train. Figure that out. Think what that saving would have meant.

The solution of this problem is right in your hands, and I think you can solve it.

Conserve New Material Supplies Regardless of Cost

Emphasis must be changed from saving labor where it has been effected by prodigal use of material

By A. G. Hoppe

Assistant to the Mechanical Assistant to the Chief Operating Officer, Chicago, Milwaukee, St. Paul & Pacific, Milwaukee, Wis.

PRACTICALLY all materials that we deal with in our everyday work are critical to some degree. Some have been denied us altogether and we have had to resort to substitutes. In many cases we are already using substitutes for the substitutes, since a wholesale substitution of one material for another invariably causes the substitute to become critical. This cannot go on forever and we come rather abruptly to the proposition of making the best possible use of the materials we will be allowed to purchase.

A railroad repair shop carries on a diversified line of work and hence it is impossible in most instances to buy material to suit the job. The material is bought in bulk and has to be cut to fit the job. This applies to many different commodities such as steel sheets, plates, billets, bars and shapes; brass and copper sheets; rubber and composition packing; textiles, leather goods, and so on. Because of this method the layout men in the shops are in a key position and must be impressed with the importance of their part in the matter of conservation. Unless the layout man thinks first and plans his work so as to use as little material as possible, he can cause an untold amount of waste.

The engineering department can be of considerable assistance. A specific instance of this is found in the general employment of fabricated parts as substitutes for steel castings, which are assembled by welding. If the designer will use as few different thicknesses of material as possible, the layout man has a better opportunity to utilize his material to the best advantage. In this type of work bosses, gussets, and braces are commonly employed and the layout man will be able to fit these small parts between the larger portions. If necessary, shearing diagrams should be prepared. Complicated contours are often encountered in the design of a substitute for a steel casting, particularly if an attempt is made to reduce the welding to a minimum. However, by the judicious use of welds in strategic places, almost any complicated piece can be reduced to simple components which can be cut from a sheet or plate with little or no waste, whereas the cutting of the complete piece would result in considerable waste.

This procedure may not always be the most economical from the standpoint of labor or convenience, but our present purpose is to save material, and convenience and cost become secondary matters. We may also have to revise our ideas of housekeeping slightly and permit the accumulation of small pieces of material ordinarily scrapped for use as clips, gussets, bosses, etc.

Emphasis Transferred from Labor to Material

I believe it will be admitted that we in America have been very prodigal in the use of materials in our attempt to effect labor savings. To assist us in these efforts the machine-tool designers have placed machines at our disposal capable of removing large amounts of material in a minimum of time. The manufacturers of flame cutting equipment have produced devices which will permit of making complicated parts, as it were, out of the whole cloth from plates or billets, eliminating the necessity of forging. The aim has been the production of a given part at the lowest overall cost, even though in some instances, 50 per cent or more of the original material was cut off in the process.

In this respect the machine tools are the greatest offenders in that they make chips or shavings out of the material removed, and such waste is at best only rather poor melting scrap. Specific examples of this are locomotive valve stems, frame splice bolts, and similar turned objects. Where work of this type is of sufficient volume it can, no doubt, be shown that it is cheaper to machine out of bar stock than it is to forge down the smaller diameters or upset heads, etc., and set the pieces up individually for machining.

The flame cutting devices are not quite as wasteful, as here a clever operator can save considerable material by properly planning his work. Furthermore, the material which does fall off as unusable scrap has a higher value. However, the entire picture has changed with

respect to saving labor at the expense of materials. In fact, the present situation is such that unless we save material on which to use the labor, we won't have any material on which to save the labor.

Back to the Forge Shop

Undoubtedly the answer to the above is a return to more intensive use of the forge shop. In the case of the valve stems mentioned above, our engineering department made up a compromise forging from which it is possible to machine the valve stems used on any of our locomotives. The weight of this forging is only slightly more than half of the weight of the bar required to produce a valve stem by machining only, and in this case there was very little, if any, difference in the labor cost to forge and machine.

Similarly, in the production of larger forgings the part can be roughed out under a steam hammer and then finished more nearly to size with the torch at a considerable saving in material.

The matter of keeping down store stock, influenced also by convenience for the shop, has led us in many instances to try to make one rough part serve too many purposes. An illustration of this is the use of heavy-walled bronze bushings to serve as rough stock for a considerable number of finished bushings. Here again, machine tools can cut off material in a hurry, and it is convenient for the shop to set up a long, heavy-walled rough casting, and proceed to make almost an infinite variety of finished bushings. No doubt, by this procedure the stores department can protect a given number of articles with less total stock than would be necessary if each article were made from a separate pattern with a minimum allowance for finish. Our purchasing agent has been calling attention to this matter for many years pointing to the high ratio of bronze borings sold to the brass manufacturer, to the total bronze purchased. Apparently it took nothing less than a war to make us see the light.

Make Replacement Parts Hard to Get

In our efforts to save labor or time, we have made replacement parts too readily available. No doubt, in many cases it is cheaper or takes less labor to remove a given part by destroying it and applying a new piece. Sometimes this procedure is again purely a matter of convenience. Bolts, nuts, pipe and pipe fittings undoubtedly suffer most from this practice. The judicious use of wrenches will save much of this type of material. If necessary, cutting torches may have to be kept under lock and key and used only as a last resort and then with the approval of a supervisor. One of our shop supervisors at a recent meeting gave us an antidote for this practice when he said, "Make it hard to get." If we do make it harder to get new parts, the workmen and supervisors will think twice before removing a part by destroying it.

Similarly, parts are often renewed when a little ingenuity will keep them in service. Sometimes we may have to resort to methods considered questionable, but if the practice is safe and does not violate any regulations, it is certainly justifiable under present conditions. A case in point is the matter of loose driving-box brasses which in many instances can be tightened by the use of shims and rendered fit for further use. The rules for the inspection of steam locomotives recognize this practice and permit shimming of driving-box brasses provided only one thickness of shim is used.

In our efforts to keep existing parts in service as long as possible, full advantage should be taken of established limits of wear. This applies particularly to parts governed by regulations of either the Interstate Commerce Commission or the Association of American Railroads. Some of the railroads in an effort to avoid conflict with such limits have applied somewhat more stringent regulations to govern their own practices. The limits established by the above agencies undoubtedly are considered safe and more stringent limits are not justifiable under present conditions. Car wheels and locomotive tires are important examples of parts subject to such regulation, and every effort must be made to keep such parts in service as long as possible.

Grinding Car-Wheel Treads

An invaluable aid in the conservation of tread metal on car wheels is a suitable wheel grinder. The Committee on Wheels of the Association of American Railroads has long recommended the use of wheel grinders for grinding our flat spots on chilled-iron wheels for further use in interchange, and permits the use of chilled-iron wheels trued up because of out-of-round condition on the owner's cars.

Grinding is also advantageously used on wrought-steel wheels to remove built-up treads, and to restore worn treads in the absence of excessive flange wear. The latter is particularly applicable to wheels used in high-speed service where excessive tread wear cannot be permitted, and in most instances a tread can be dressed up several times before the height of the flange approaches the condemning limit. The advantage of grinding obviously is in the fact that only sufficient tread metal is removed to true up the wheel and restore the tread contour. When this is done by turning, it invariably results in a definite loss of at least $\frac{1}{16}$ in. of tread metal since a cut of less than this is not practicable.

Non-Metallic Materials

So far we have discussed almost entirely metallic materials. Some of the non-metallic materials, while not used so extensively, are none-the-less equally important, and equally or more critical. Rubber apparently is, for the time being, unobtainable. From a purely conservational standpoint we can only impress on every one to take care of, save, and protect what rubber they now have, as it must last a long time. We can only point out that rubber products such as air, tool and welding hose, welder and battery-charging cables, etc., should be protected from mechanical damage and kept from contact with oil and grease. The length of such connectors should be kept at a minimum and any excess material saved for future use. This may require the installation of additional air or power outlets but this would certainly be justified.

Proper care and maintenance of equipment certainly bears a definite relationship to conservation of material. Proper lubrication of motors and shop machinery will prolong the life of shafts and bearings. Keeping electric motors clean and free from dust contributes to better operation and longer life of the windings. Ninety per cent of all motor failures are due to excessive bearing wear which in time permits contact between the armature and field pieces. Periodical gaging of the air gap will show when bearing renewals are necessary. An example of what such gaging will do will be found in one of our grain elevators where the insurance company insists on this practice and for 10 years we have had no motor failures from armature and field contact.

Electrical control equipment, switch contacts, insulators, etc., if periodically cleaned will function better and longer. We are prone to forget transformers because

they give so little trouble, but if ever they needed care with proper renovation of the cooling oil, now is the time. The Electrical Section of the Association of American Railroads has outlined an excellent procedure of maintenance for motors, controls, and other electrical equipment which, if followed, should prevent expensive failures.

Lubricants are becoming more and more critical. The fats used for making greases may soon be restricted to such an extent that little or none will be available for grease manufacture. Grease can be easily wasted and should be used with judgment, particularly when applied with pressure guns. There is no need in these times to ballast the right of way or plaster the bottom of the running board, the boiler, and the driving-wheel centers of a locomotive with rod grease. The special Diesel oils are already practically unobtainable. What oil is available should be used as long as practicable, and proper laboratory control of the oil in use will logically determine when renewal is necessary. While this may make subsequent reclamation somewhat more difficult, it does not render it impossible.

Tool Steels

The high-speed varieties of tool steel are in the same class with rubber. All railroads have tools and tool steel on their property that they are not aware of. If you have not already done so, a good house-cleaning of all lockers, corners, bench drawers, covered pipe trenches, and similar pits, in fact any ledge or shelf capable of supporting anything, is in order and will undoubtedly uncover a lot of surprising things among which will be a lot of tools and tool steel, some of which will be of the high speed varieties which cannot now be purchased. There is no longer any justification for tools made of solid high-speed steel. If the various types of bit holders are not applicable, suitable large planer and lathe tools can be made by cementing a high-speed cutting edge to a piece of 1045 steel using powdered 1045 steel as cementing agent.

The conservation of material involves, in addition to proper use, the proper protection and care in handling. It seems unnecessary to touch on this but I'm quite sure all railroads have been guilty of failure properly to protect steel in storage, and have also failed to provide proper storage conditions for other vital materials. It seems we sometimes go out of our way to store rubber goods, tool handles, switch brooms, etc., in nice dry sunny places, and paper containers in damp places. While the engineering or mechanical departments are not primarily responsible they should at least call the matter to the attention of the proper individuals. A somewhat similar situation exists with respect to handling of materials in loading from or loading into cars. While some materials are apparently strong and far from fragile, as for example locomotive tires, they should not be tossed into a pile indiscriminately with resultant nicks which may eventually cause the part to fail in service.

Check Stores Stocks for Obsolete Items

So far the discussion has been purely from the standpoint of the railroads making the best possible use of available materials for the operation of the railroad. It seems to me, however, that we should look beyond the immediate need of the railroads proper. A careful check of material in store stock, particularly steel castings, will show that there are certain items which, because of obsolescence or other reasons, will never be used and cannot be altered to make them usable. Such material is of no earthly use to the railroad and should certainly be released, through sale as scrap, for use in the war effort.

This discussion applies, of course, to all usable material whether new or second-hand. A steel plate which has been used on a bridge or car, but is still in good shape, should be treated in the same manner as a new plate and used with equal economy. Structural steel recovered from dismantled cars can be used in kind for many purposes. Practically all of the large jibs used in our car shop have been made from old center and side sills. Two small gantry cranes and a small transfer table for Diesel locomotive maintenance have been built exclusively from old car sills. While portions of such sills may have suffered from corrosion the balance can be utilized by cutting angles from channels and tees from I-beams.

Scrap Axles as Forging Billets

Scrap car axles can be used for a variety of forgings which permit carbon from 0.35 to 0.50 per cent. Among such items are draft-gear keys and follower plates. Locomotive axles not fit for further use in kind also make excellent forging billets for many purposes. Steel castings have replaced numerous simple forgings for locomotives. The present demand for steel castings for defense practically stops this practice and it will be necessary to return to forgings for many purposes. Engine-truck axles can be forged down to round bars for use as piston rods, wrist pins, small crank pins, crank-pin collars, etc.

This may appear to some to be questionable practice. However, all axles should be checked with the Magnaflux for cracks before attempting further use, and cracked portions cropped off. Furthermore, the heating and working disclose defects which may be missed by the Magnaflux. It appears far better to use a part carefully made from a second-hand axle than to keep a locomotive or car out of service for want of an important forging.

All railroads have tools and tool steel on their property that they are not aware of. If you have not already done so, a good house-cleaning of all lockers, corners, bench drawers, covered pipe trenches, and similar pits, in fact any ledge or shelf capable of supporting anything, is in order and will undoubtedly uncover a lot of tools and tool steel, some of which will be of the high speed varieties which cannot now be purchased.

The Kaleidoscope of Material Substitution

Finding substitutes for substitutes demands constant exercise of ingenuity — Many materials affected

By C. B. Bryant

Engineer of Tests, Southern, Alexandria, Va.

DURING the past ten years, railroads have been substituting economical materials and operations for more costly materials and operations, and have been making a good job of it. In this new day of changed operating conditions many of the old rules of practice must be revised. Instead of "can we afford it" or "how much will it save," we are now learning to substitute "is it available" and "can it be made to fulfill the function of what we have been using." We are still substituting for what we do not have—during the thirties we were substituting for money, now we are substituting for materials.

Railroading is fundamentally an operating industry, using materials and equipment, with which we must live for many years after we have acquired them. For the manufacturer, once a change is decided on and the shift in production is made, the problem is largely settled. In railroading, however, the answers to design and manufacturing problems must first be found, and then the maintenance and operation problems must also be solved.

Substitutes Are Being Found

No one person or organization can, or is attempting to claim credit for complete originality and independent thought in this work. On the contrary, the progress we have made and are expecting to make in the near future is built on a splendid cooperation between different individuals and different organizations and the development of constructive suggestions and ideas received from any source. Much of this information is already available in the minutes of various committee meetings and new standards of materials and designs adopted by the A. A. R., A. S. T. M. and War Production Board technical committees. Consequently, what I tell you is really only a summary of the actions given from my point of view. I shall not attempt to limit the items mentioned to those falling within the mechanical field of railroad operations but shall cover operations in general.

How Scarce Is Copper?

Last December, when the impact of actual war first struck us, we had already the advance knowledge that many materials were going to be scarce. Aluminum and some other metals had already disappeared from railroad uses but such uses were relatively minor and the full realization of what we were facing in the way of substitution had not yet developed. The first scarcity which hit home to railroad operations was that of copper on which railroads depend for many important operations, although the total tonnage consumed is not large. The necessity of not only reducing our purchases of copper and copper alloys but the probable necessity of releasing large quantities of copper alloys already in service on the American railroads to other industries was the first great problem which the railroads faced.

The largest single item of copper used by the railroads is in car journal bearings, of which there are an estimated 20 million in service, containing in round figures 170,000 tons of copper. These bearings when worn out are not destroyed but are remelted and remanufactured to an estimated extent of about 25 per cent of the total number each year. If while performing such remelting and remanufacturing we could release copper to other users or if we could reduce or eliminate our requirements for make-up material to replace that actually worn away in service and lost in foundry operations, we would then be contributing to relieving the shortage of copper to that extent. We were told by the War Production Board that, while the total amount of new copper to be made available in 1942 would be approximately 45 per cent more than in 1941, the increased essential demands for military uses only would require all of the production increase and also a considerable proportion that would otherwise go into ordinary civilian uses.

New Bearing Designs

During January of this year the A. A. R. adopted new compositions for the bronze backs of car journal bearings, reducing the maximum copper content permissible by approximately eight per cent. There was also adopted a revised and lightened design for bearings, resulting in the saving of approximately five per cent of the amount of bronze used per bearing. At that time a new Committee on Journal Bearing Development was set up which immediately instituted an extensive research program looking toward further reduction in use of critical metals. This committee has been functioning in an extremely energetic way and during May, as the result of the research work which it had been conducting, it offered a further modification in journal bearing design resulting in the saving of an additional 12 per cent of bronze. There are many possibilities of further savings not only in further changes in design but in the substitution of other metals in whole or in part for bronze. I am hopeful that within the next few months there may be other similarly constructive actions derived from this work.

The entire field of railroad uses of copper and copper alloys has been studied and restudied. In shoes and wedges for locomotive driving boxes, malleable-iron faced with bronze bearing surfaces can be substituted for the solid bronze castings heretofore used. This substitution will not result in any ultimate reduction in the use of bronze but it will make available for other necessary uses a considerable tonnage of bronze now in service. Grey iron bushings can be substituted for bronze in certain classes of power with probability of shorter life and increased cost but with the necessary saving of non-ferrous metal. Economical long-life copper pipe and tubing is being replaced with steel and wrought iron.

In the field of locomotive driving-axle bearings substitution of higher lead content bronzes for those now being used is made possible by casting such bearings in metal or "chill" molds instead of sand molds with resultant reduction in quantity of tin and copper requirements.

With respect to air-brake parts a special A. A. R. committee appointed to study that subject has reported the possibility of replacing 34 per cent of the brass now being used by other non-critical metals.

Substituting for Tin

When the great bulk of the world's tin supply coming from the Far East was cut off, the tin situation suddenly became even more critical than the copper. The first action taken to meet this situation was a revision in A. A. R. requirements for soft-babbitt journal-bearing lining metal, in which tin constituted about 4½ per cent, by which the tin content was reduced to a maximum of 3 per cent. The thickness of the journal-bearing lining metal was reduced first from ¼ in. to 3/16 in. and subsequently in May again reduced to ⅛ in., the changes in design and composition together accomplishing a saving in tin approximately 75 per cent of the amount previously used. It is not easy to make such sweeping changes as these and they must, of course, be made only with the certainty that railroad operation will not be rendered unsafe or undependable. These changes and others to be mentioned later have not been made with any idea that they will result in operating economy. In some cases we know that costs may be materially increased. They have been adopted as a means of carrying us through the period of war scarcities when it is and will continue to be impossible to secure materials to operate on the same basis as previously.

Other types of tin-bearing metals have also been affected by the tin situation. Recent W. P. B. orders have placed severe restrictions on the percentage of tin that can be used in all such mixtures and this action has intensified the interest of users in various low-tin specialty mixtures that have been developed for bearing metals. Some of these substitutes have been used sufficiently to warrant greater attention. An alloy consisting of 98 per cent lead hardened with calcium and about one per cent tin has been widely and successfully used in Diesel-engine bearings and to some extent in railroad car journal bearings. Its use in interchange freight car service has been approved by the A. A. R. Another specialty bearing metal consists of less than one per cent tin with antimony and arsenic as hardeners in a lead base. This alloy is being investigated in connection with its possible use in car journal bearings but the results are not yet available.

In the field of solder, tin is being replaced by other metals, including silver. Tests which have been made on my own railroad show good possibilities for such solders but indicate the necessity for material revision in shop practices in order to use them.

Alloy Steels Affected

Railroads have not been large users of alloy-steel forgings but a considerable number of locomotives are now operating which were designed around certain alloy steels. With the gradual and now virtually complete disappearance of alloys from railroad uses, including nickel, chromium, vanadium and the probable elimination of molybdenum, together with the necessity for sharply reducing manganese use, the problem of maintaining these alloy-steel locomotives has become acute and difficult. The substitution of carbon steel for nickel-alloy boiler plates in locomotives designed for the latter necessitates reduction in working pressures, increase in weight, or both, with consequent reduced transportation efficiency for such units. Locomotives designed with light-weight alloy-steel reciprocating parts require extensive rebuilding when heavier carbon steel parts of equivalent strength are substituted.

In such cases, restrictions in maximum permissible speeds are necessary. Intensive studies are being made looking toward the possible substitution of quenched and tempered carbon-steel forgings for alloy steel and preliminary experience of those roads which are facing this problem indicates that the reduced efficiency and capacity of the locomotives may not be as serious as was first feared. Fortunately, this difficult situation does not apply generally to the great bulk of steam locomotives now in service on the American railroads but it is nevertheless a very serious situation for those railroads that operate the engines in question and, in view of the present extreme demands for power, it is serious to the railroad transportation picture as a whole.

In certain classes of carbon-steel forgings, particularly those subject to high stresses, it has been necessary to use aluminum as a deoxidizer in making the steel in order to produce the fine-grained micro-structure considered essential for this class of service. Aluminum has not been available for this use and so far no satisfactory and available substitute has been found. This situation is receiving intensive study. Information just received from the W. P. B. states that it will probably be able to authorize sufficient aluminum for this purpose.

No one person or organization can, or is attempting to claim credit for complete originality and independent thought in this work. On the contrary, the progress we have made and are expecting to make in the near future is built on a splendid co-operation between different individuals and different organizations and the development of constructive suggestions and ideas received from any source. Much of this information is already available in the minutes of various committee meetings and new standards of materials and designs adopted by the A. A. R., A. S. T. M., and War Production Board technical committees.

Bessemer Replaces Open Hearth

In the field of freight-car construction Bessemer steel has been accepted as a substitute for open-hearth steel in certain car structural parts and to this extent the productive capacity of open-hearth steel has been released for military uses. Under the allocation plan of the War Production Board certain steel mills are operating almost entirely on a basis of specifications for ship-building plates and in many instances plates to that specification have been used in car construction instead of the usual

structural grades of steel. We do not anticipate any disadvantages in service because of these substitutions.

In both mechanical and maintenance-of-way equipment the growing utilization of welding as a substitute for the replacement of worn parts has been greatly stimulated and expanded, although we may reach a limit to which these operations can be used because of the necessary alloying constituents of the welding electrodes and rods.

Rubber

The next great scarcity which faced us was that of rubber, with which everyone is already familiar. Railroads are large users of rubber hose and the Mechanical Division of the A. A. R. has agreed upon a series of emergency rubber-hose specifications which will materially help conserve the dwindling stock pile of crude rubber which was on hand in this country at the time of the fall of Singapore. These changes largely contemplate the substitution of new rubber by reclaimed rubber. They result in inferior hose with anticipated life probably less than half that we have been securing in the past.

It is hardly necessary to mention the care with which such changes must be considered, particularly in certain grades of hose, such as air-brake hose, where failure is likely to result in serious accidents. We believe we have adequately safeguarded this phase of the matter and that the substitute hose will be no more likely to sudden failure than that previously manufactured. These modifications in rubber are not only uneconomical at the present but will doubtless ultimately result in increased demands for rubber due to the shortened life of the emergency products. The changes have been made necessary notwithstanding these disadvantages because of the absolute necessity of continuing operations until such time as synthetic substitutes for rubber may be available to us several years hence.

We are studying the use of spliced short lengths of worn-out hose to build up long sections where normally new hose would be provided and we also are considering the use of flexible metallic connectors of various types for certain applications where rubber hose is more desirable.

Railroads use rubber in a large variety of miscellaneous applications, all of which were carefully studied by a special committee on rubber conservation appointed by the A. A. R. at the beginning of the war. Last January this committee issued its first recommendation, which listed 66 specific applications of rubber for which other materials can be substituted and made definite recommendations for the material to be used in the replacement of each item. For 40 other items no definite substitute could be immediately suggested and intensive study is being given these in cooperation with manufacturers with the expectation that in many cases the rubber can be eliminated or its use greatly reduced.

Changing Paint Specifications

In the field of paints the railroad specification writer has faced the necessity of making changes in formulations which have been developed in the past, because certain materials are no longer available. Outstanding among these is China-wood oil, a most valuable ingredient for manufacturing high-grade freight-car finishes. China-wood oil possesses certain properties of pigment suspension, drying characterstics, water resistance and durability, which, in spite of its high cost, justify its use. With the stopping of imports of this oil from China and the freezing of stocks already on hand for military uses, some substitution of available material had to be made. The most logical substitute, Perilla oil, is unfortunately equally scarce. Specially processed dehydrated castor oil can be manipulated so as to be a fair substitute for the China-wood oil and it is apparently available in adequate quantities to take the load.

In the case of paint vehicles known as alkyds which comprise a whole family of synthetic resins, one of the basic raw materials is the compound phthallic anhydride. While the alkyd vehicles are yet relatively new in exterior finishes, they have been making rapid progress and show much promise. They have been used to some extent in freight-car finishes. Some months ago the government placed orders for another derivative of phthallic anhydride, in connection with explosive manufacture, which absorbed the entire productive capacity of the country for a long period, thus making it impossible for industrial users of alkyd paints and enamels to extend the use of these materials as a substitute for the China-wood oil finishes. In the field of other synthetic resins, such as the phenolic type, also much used in high-grade finishes, government requirements in connection with explosive production have also absorbed much of the basic raw materials. Here was a situation where several of the most dependable substitutes were unavailable and much work had to be done in order to locate other substitutes which would not be too inferior and which could be obtained.

In the field of paint pigments, similar scarcities developed. One of the desirable combinations of pigments for priming paints on steel surfaces involves the use of zinc chromate. With the loss of the Philippines and the cutting off of much of our supply of chromium ore, the production of zinc chromate pigments has been affected and, while they are still available in small quantities, it seems likely that we shall have to divert our uses to other materials. This problem is not fully solved as yet.

Greases

One of the soft lubricating greases extensively employed in locomotive lubrication has in the past been rendered adhesive so as to avoid being thrown out of revolving parts or forced out of loosely fitting bearings by the use of rubber latex or of a petroleum derivative having rubber-like properties. The rubber latex for this purpose is no longer available and the petroleum derivative has been largely withdrawn from grease manufacture presumably because it can be diverted into synthetic rubber production. Work is under way at the present time in an effort to retain the desirable properties of such greases without resorting to these two no-longer-available materials.

Fewer and Poorer Brushes

Railroads are very large users of brushes for paint and varnish application, as well as for many other uses. Bristle for brush manufacture is hog hair and unfortunately the breeds of hogs raised in the United States do not grow bristle. The world's supply has come from other countries, predominantly in the Orient, including Siberia and China. The Russian bristle disappeared from the market some years ago and for the past few years the Chinese supply has been the one on which the entire brush industry depended. Bristle is a high priced commodity and even after the Japanese had closed the Chinese seaports, bristle still came out of China in fair volume over the Burma Road. Even that supply has not been available for some months and the brush industry is literally living on its fat and is depending on the stocks of bristle already on hand.

The War Production Board recognized the urgency of this situation during February, 1942, by issuing an order

requiring the use of some substitute or adulterant in all brushes to the extent of 45 per cent of the total normal bristle content of the brush. Horsehair has been substituted generally but the blended horsehair and bristle brushes will not give good performance or long life as compared with the pure bristle brushes. There are many places where spray painting can be substituted for brush painting and this is particularly true on freight cars and in maintenance painting of structural steel. For many applications, however, only brushes are practical and we must get along the best we can.

The production of synthetic bristles has not yet reached the point where satisfactory paint-brush bristles can be made, as the synthetic bristles do not have the same characteristics of tapered structure and paint carrying properties as the natural bristle. For stiff brushes, such as scrub brushes, tooth brushes, hair brushes, etc., the synthetic bristles are entirely satisfactory. We are hopeful that means will be found soon by which synthetic bristles suitable for paint brushes can be produced.

Substitutions and Safety

One of the constituents in the burning composition of a railroad fusee is potassium perchlorate, which, unfortunately for us, is also one of the major constituents in certain types of aerial flares necessary for use by our air forces. A considerable part of our potassium perchlorate has been imported in the past, much of it from Japan, and the domestic production is wholly inadequate to satisfy the requirements of the existing civilian plus the new military demands. We have been forced to reformulate the composition of our fusees to meet this situation by the substitution of other available compounds for the potassium perchlorate and fortunately we have been successful in this, although the new formula fusees are much inferior to the old.

The use of railroad electric hand lanterns for signaling in train operation instead of the familiar kerosene lantern has been growing rapidly in recent years and several states have enacted laws making it mandatory to use electric lanterns for this purpose. Two of the principal ingredients in the dry cell batteries for these lanterns are zinc and manganese dioxide, both of which are on the critical list of materials. The battery manufacturers are extremely alert to this situation and are making the utmost efforts to continue to produce such batteries in adequate quantities, although their mixtures have been altered from those formerly used. One proposal which we are actively investigating at the present time is a newly designed rechargeable storage battery built on the same principle as the battery in your car. In using such a battery it is kept in a charging device when not in actual service in order to keep it in operating condition. We do not know how this development will work out. The batteries themselves are very expensive, a recharging device must be purchased for every point where batteries are used, and men must be trained to utilize such devices intelligently.

I give you these details so as to acquaint you with a few of the situations with respect to material substitutions that are facing American railroads. Some of these have already been solved at least to a workable extent, others still require research and testing before a solution can be reached. We on the railroads who are immediately concerned with many of these problems are working hard on them and shall continue to do so. The necessities are great and I am certain our efforts to solve these problems will be equal to the occasion.

The Reclamation Plant—A Dependable Source of Material

Processing of scrap offers opportunities for the railroads to help themselves and the nation at war

By G. A. Goerner

General Storekeeper, Chicago, Burlington & Quincy, Chicago

WEBSTER defines reclamation as the act of making industrial waste products useful. It is not necessary to bring the material back to its original condition. It is only necessary to make the waste product useful. It may be reworked, reshaped or converted into something entirely foreign to its original service. So long as there has been a profitable or advantageous conversion of the scrap item, the process is reclamation. Many items of material are restored to their original state of usefulness. Other work is performed so that the material will serve much better and longer than when it was new.

This may sound fantastic but it is true. At no place are defects in materials, weak spots in design and places of unusual wear more easily detected than at central scrap docks. Here, all car couplers that have been sent in as scrap are segregated to determine if they can be reclaimed. This grouping often discloses a uniform type of break which can be repaired by welding. Items will also be found where the original wearing surface may be built up with welding material to produce a product far superior to the item in its original form. When instances like these are discovered, action is taken to correct this condition on future new material, and the economy in labor and maintenance in not having to replace such parts when they wear out may be even greater than the saving in replacement material.

When is Reclamation Repair?

It is difficult to differentiate between reclamation and repair. A considerable portion of the work done at railroad reclamation plants is repair work, and some reclamation is performed in roundhouses and shops. However, it is not so important to draw the line between repairs and reclamation as it is to emphasize the importance, at a time such as this, of doing all that can be done to save the manufacture and use of new materials.

The net saving from reclamation on one railroad alone during the last calendar year was nearly one-half million dollars. This was the accomplishment of the reclamation plant only. It does not cover any materials repaired or manufactured at shops, roundhouses or at any other place on the railroad. In addition, there was manufactured at the reclamation plant from scrap, material valued at $65,000 at a net saving of $27,000. These savings

represent the difference between the scrap value of the material plus the cost of reclaiming, including all overhead, such as supplies, electric current and stationery, and what it would have cost if the material had been purchased. Since no material at this plant is reclaimed except on orders from the general store, it would have been necessary to purchase new all the items if they had not been reclaimed or manufactured. The total scrap utilized in this manner amounted to nearly 10,000,000 lb., or 5,000 net tons.

Cost Factors Less Important Now

While, under normal conditions, no reclamation or repairs to material should be made unless there is a saving to the railroad, there are occasions which justify an expenditure equal to, or even greater than, the cost of the new material. Today reclamation has become a national necessity. It is no longer only a matter of economy, but a matter of conservation. In self-preservation, the railroads must reclaim material that is difficult to replace. The reclamation of old materials, moreover, saves new and raw products for defense purposes and is, therefore, a patriotic duty in the interest of defense.

Burlington Reclamation Work Centralized

Usually that which is everybody's business receives no special attention. Reclamation should, therefore, be handled as a specialty and studied as such. It will suffer from lack of attention unless it is made the particular business of one man who will head that work. The Burlington inaugurated the office of superintendent of reclamation and scrap 16 years ago. Most other large railroads also have specialty men for this work. Unless there is such specialization, there is the danger of reclaiming material that is not needed and of discarding material as scrap which should be reclaimed. There will also be a lack of uniformity in the work that is done and perhaps no check on the costs to determine its economy.

Centralized plants provide the best means for efficient reclamation. It is the best arrangement from a material-handling and shipping standpoint. Where the reclamation plant is located at a point other than the scrap dock, considerable material must be reshipped. Much material that is reclaimed is picked or sorted out of scrap. There is better control of this, and less opportunity of permitting reclaimable material to be sold as scrap, if the reclamation supervisors are located where they can see the scrap as it is sorted.

Centralized reclamation provides other advantages. Where reclamation is handled at a number of shops or roundhouses, there is not sufficient volume at any one point to justify the purchase of special equipment for doing the work. As an example, where all angle cocks for a large railroad are reclaimed at one point, a multiple grinder will greatly reduce the cost of doing the work. Thus, one man can grind six or more valves at a time. If scrap air or signal hose are dismantled at a number of points on the railroad, there is not enough of this work to justify special equipment for the dismantling, but when the work is centralized, modern equipment will pay for itself in a short time. There is also a better opportunity for specialization which leads to more effective work because of having more of one type of work to do. Thus, one man may become a specialist in reclaiming switch stands, another, brake beams and still another in welding car bolsters. It is not only a matter of knowing how to weld but knowing what may be welded under existing rules.

From a distribution standpoint, centralized reclamation is of special benefit. Where material is reclaimed at a dozen places on the railroad, much of it is not located at the point where it will be needed. If it must be shipped to some other point, it is likely to move in light carloads. When the work is centralized, especially if the reclamation plant is near the general store, the volume of material handling is sufficient to ship it in carload lots to most large stores or in joint carloads to the smaller stores.

Finally, centralized reclamation provides the best stock control for the material to be reclaimed. Material should not be repaired or reclaimed simply because it is reclaimable. It should be reconditioned only because it is needed for the operation of the railroad. Otherwise there is no economy in reclamation. If the reclaimed article is not going to be used, it had better be scrapped before added labor and material are spent to reclaim it. But that does not imply that reclaimable material should be scrapped because there is no order for it. On the contrary, if it will be used in reasonable time, it should be carefully stored at the reclamation plant until it is needed for stock or for use. The very fact that reclaimable material is on hand and may be reconditioned when needed for use, or for stock, permits operating on a smaller stock, for the control of supply is entirely in the hands of the railroad.

Many reclaimable items are worth nearly as much as new materials because the cost to reclaim them represents but a small per cent of the original cost. Therefore, it is as important to prevent damage to them or to avoid their loss as it was when they were new. Delicate items should be crated or boxed when shipped in the same manner that they were cared for when new. Where skids are used for transporting material between stores and the reclamation plant, much of the packing may be avoided, for the skid may provide ample protection. Reclamation by welding can only be carried out to the fullest advantage if parts of broken castings are kept together so that they will arrive at the plant at the same time. This may be accomplished by wiring them together or preparing them for shipment in a special way to bring about such results. The difference between treating old material as so much scrap or handling that which is reclaimable with proper care, on a large railroad, represents a loss or gain of many thousands of dollars. Especially at a time like this when material is at a premium, it is of utmost importance that every effort be made to preserve it.

Where Reclamation Begins

Each railroad should make a careful study to determine how much of its material may be salvaged and reused. It requires a special study of each commodity, or even of each item, because conditions on the railroad, the quantity of an item used, the source of supply and many other matters may have a decided bearing on the advisability of reclamation. An educational campaign should be conducted to train foremen or specialty men at roundhouses and shop points, as well as at all other points where material is released, to inspect the material and determine whether it really should be scrapped. Possibly it should remain in service longer; perhaps a minor adjustment is all that is needed. The best way to take care of a leak is to fix the faucet. Thus, the economy must be most effective where the material is used. It is there that any waste must be checked. In addition, a careful check should be made at the central scrap dock. Material fit for re-use and that which may be reclaimed, repaired or converted for other uses should be salvaged. Reclamation men should seek and receive the full co-operation of specialists of other departments in carrying out this work to the limits of its possibilities.

Approved Practices

A complete list of reclaimable material would be needlessly long but some of the newer ideas and methods should be mentioned.

Bolts for cars can be sorted to size, cut back, where rethreading is not desirable, and rethreaded. Engine bolts can be cut to shorter lengths or turned to smaller sizes. Much round iron and steel, scrap brake-beam rods and the like, arriving at the scrap dock, can be used for manufacturing machine bolts. Stay bolts can be rattled to remove the lime and re-used to make engine bolts or hammered into slabs for locomotive forgings. Crown stays can be annealed and reworked for stay bolts of shorter lengths.

Nuts can be sorted to size and retapped. Grip nuts can be reclaimed by giving them a sulphuric acid bath to cut off the rust, then placing them in caustic soda to stop further action of the acid. They should then be run over a revolving brush to clean the threads.

Tinware should be utilized to the best advantage by repairing. Care must be taken to prevent further damage in shipment to repair plants. An engineer's oiler that needs only the spout welded or a leak repaired may be so damaged in shipment with other scrap as to render it useless. Empty carbide cans can be converted into "dope" buckets or waste baskets. Empty paint pails can be cleaned and used for "dope" buckets and for many other purposes where cans are needed.

Worn Pipe Fittings Good for Temporary Jobs

While valves and unions are usually removed because of leaks, other pipe fittings are removed because of changes in pipe lines. All pipe and fittings removed from service should be inspected carefully and salvaged where practicable. Fittings that have been weakened because of corrosion or wear can be placed in unimportant services where little pressure is used. They can also be used for temporary jobs where they need serve only a short time. In such cases, the material should be so marked that it will not be used for important, high-pressure work. All fittings should be removed from pipe and inspected to determine their further value. Threads should be cleaned thoroughly with a fine wire brush before returning them to stock. It may be necessary to chase some threads with a hand tool or pipe tap. Where a tap is used, it should be used for cleaning the threads and not for additional tapping. Some odd size fittings can be retapped for larger pipe. Many valves that find their way to reclamation plants need only cleaning and regrinding. Usable parts from valves that must be scrapped should be salvaged and used for repairs to other valves. Often pipe turned back as scrap is fit for further service except that the threads are battered or worn. Such pipe should be cleaned, cut back and rethreaded. Shorter pieces will do for nipples.

While, under normal conditions, no reclamation or repairs to material should be made unless there is a saving to the railroad, there are occasions which justify an expenditure equal to, or even greater than, the cost of the new material. Today, reclamation has become a national necessity. It is no longer only a matter of economy, but a matter of conservation. In self-preservation, the railroads must reclaim material that is difficult to replace. The reclamation of old materials, moreover, saves new and raw products for defense purposes and is, therefore, a patriotic duty in the interest of defense.

Coil and elliptic springs can be retempered and brought back to their original set. Broken leaves of elliptic springs should, of course, be replaced. Proper facilities for testing springs should be provided so there will be no question about their service after they are reconditioned. The steel from scrap springs offers many opportunities for the manufacture of specialties. "S" wrenches, double or single end, can be made from elliptic springs. Nail-pulling bars, stone chisels and many similar items can be made from scrap coil springs. Scrap brake-cylinder springs provide good material for the manufacture of journal-box packing hooks and irons.

Few items of scrap offer so many profitable outlets as scrap boiler flues. They can be used for the manufacture of locomotive pilots, farm gates, snow-fence stakes, sign posts, fence posts and jetties. Scrap dealers are always in search for them.

Driving axles can be reworked into piston rods and other forgings. Car axles can be reclaimed by building up collars of journals or by converting them into axles with other size journals. Piston rods can be turned down for use on lighter power or, if worn to the limit, can be used for making shafts for roadway machinery. Repairing brake beams by using second-hand parts, some of which may be reclaimed by welding, is profitable.

A. A. R. rules must be followed in reclaiming railway material, but today there are a number of items that ought to be considered so as to extend the use of material where this can be done with safety. With modern welding methods there are few castings and forgings that cannot be reclaimed by welding to repair broken or cracked places or to build up worn places.

Few commodities can be reworked for so many and varied uses as second-hand lumber. For large timbers removed from bridges and buildings, a resaw plant is advisable. At such plants the timbers can be sawed to smaller sizes for building work, for car stakes and for the manufacture of other wood products. Car siding, which cannot be re-used as such, can be used for the manufacture of grain and coal doors. Finally, second-hand lumber can be used as patch lumber for coal cars or cut to suitable sizes for use as blocking in freight houses and cars.

The Purchases and Stores section of the A. A. R. has worked diligently on this subject for years and has made hundreds of recommendations of methods by which items may be reclaimed profitably. These recommenda-

tions cover ways of salvaging everything from paper to locomotive forgings, from rubber to rail. In spite of all the progress which has been made, however, hundreds of profitable ideas on material reclamation still lie dormant or hidden from view, and the needs of the present make it highly important that they should be brought to light.

Discussion

Following the presentation of papers at both the morning and the afternoon session, several persons took part in a general discussion which dealt with all of the subjects.

In throwing the meeting open for discussion Mr. Ellis commented on the need for careful servicing of shop machinery, particularly with respect to lubrication. Tools which have been worked from four to eight hours a day, he said, might soon be called upon for 24 hours daily.

Speaking specifically to the manufacturers of railway supplies and equipment, he asked that they assign their salesmen, with their special knowledge and engineering ability, to the task of helping the railroads to conserve the materials or equipment with which they are familiar and assist them in keeping it patched up, if necessary.

Mr. Ellis expressed the hope that the mechanical engineers present at the meeting had received sufficient encouragement and inspiration from what they had heard at the meeting that they would go home ready to exercise their initiative, and that the mechanical and other officers in attendance had gotten enough out the meetings so that they would go home and turn their engineers loose in fields in which they had never dreamed of putting them before.

E. S. Pearce, president of the Railway Service and Supply Corporation, Indianapolis, Ind., commented on the journal bearing research program of the Mechanical Division of the A. A. R., to which Mr. Bryant referred in his paper on substitutions of materials. He attributed the dispatch with which the work was gotten under way by the railroads to the fact that laboratory facilities and trained personnel were already available, as well as the accumulated experience of 10 years of private research along similar lines.

Analyzing the problem which faced the special journal-box research committee of the Mechanical Division, Mr. Pearce named three alternative courses which it could pursue in carrying out its objective to save copper. These were, first the immediate possibility for conservation by reducing the physical dimensions of the standard journal bearing. Some of these changes not only reduced the weight but, he said, were known to increase the service life considerably. By the employment of proper practices in the manufacture and use of the bearing the causes of defects and failures could be eliminated or controlled, thereby reducing the relatively large bearing turnover.

The second alternative was to reduce to a minimum the use of copper alloys by a combination of substitution and design modification. The third, he said, was the elimination of copper alloys by complete substitution.

Mr. Pearce reviewed step by step the developments in the research program up to the present time, in the first several steps of which a reduction of about four pounds in the weight of the bearing has been effected. The next step, he said, is a bearing which is now under service test which reduces the bronze content of the bearing from the standard 25.25 lb. to 8.75 lb. in a 5½-in. by 10-in. size. This consists essentially of a malleable-iron adapter, matching in shape and dimensions the present bearing in which the light-weight alloy bearing is inserted. He pointed out that if all the estimated 14 million bearings in service were to be fitted with these substitute bearings, assuming that they average 5½ in. by 10 in. in size, the aggregate tonnage of non-ferrous metals which could be diverted to other uses would be: copper, 84,000 tons; lead 25,000 tons; tin, 6,000 tons; antimony, 3,000 tons.

John R. Jackson, engineer of tests, Missouri Pacific, who is also a member of the special A. A. R. committee which has in charge the journal bearing research, said that the committee is now undertaking the more difficult part of its assignment in studying the thermal conductivity and deformation of non-conventional design and materials under full loads at a top speed of 100 m. p. h. Mr. Jackson pointed out the difficulties of making major changes in bearings. Radical changes, he said, are impractical unless, as in the case of roller bearings, the present assembly is replaced with an entirely new design.

Guy O. Beale, chief purchasing and stores officer of the Chesapeake & Ohio, the Nickel Plate, and the Pere Marquette, commented on the relations between the increased requirement of materials and the efforts of the railroads to bring down their stores inventories as required under Priority Order P-88. He said that because of the amount of material reclaimed, the consumption of the stores stock on many items had been so much reduced that the rate at which inventories of these items are being reduced has been materially slowed up. Since Priority Order P-88 went into effect, he said, the railroads have been able to get along with a smaller inventory because of the improved priority assistance which has become effective under that order. He said that if the three railroads with which he is connected can do as well within the next 12 months as they have during the past few months, there will be nothing to fear.

K. F. Nystrom, mechanical assistant to the chief operating officer, Chicago, Milwaukee, St. Paul & Pacific, spoke of the success with which steam railroads have reduced the number of unserviceable locomotives to considerably less than eight—even less than five—per cent in some cases, and the per cent of bad-order freight cars to an average of around 4½. He emphasized the important effect on the power supply during the coming months if it were possible to bring the unserviceable locomotives generally down to less than 10 per cent. From his own experience he expressed the definite opinion that it would be possible to reduce bad order freight cars to less than 1½ per cent.

D. A. Steel, purchases and stores editor, Railway Age, commenting on Mr. Goerner's paper, suggested that the handling of scrap and reclamation at central plants must depend to some extent upon circumstances because some railroads never have had the centralized plants and others who formerly had them discontinued their operation during the depression. He thought that in this case the railroads would have to carry on their operations at the various shop points. He also suggested the desirability of developing objectives of some sort to serve as stimuli in the field of reclamation.

In his closure Mr. Goerner reiterated his belief that the centralized reclamation plant gives the best results, but made it clear that each case must be studied and the type of operation determined on the basis of the specific circumstances involved. He also brought out that on the Burlington no new items of reclamation are added without first referring the process of reclamation and the results to the engineer of tests for his approval both of the method proposed as well as of the product.

EDITORIALS

Keep the Cars Moving

Some extremely pertinent information regarding the inspection and repairing of freight cars is included in a committee report presented at the annual meeting of the American Association of Railroad Superintendents held at Chicago in May. According to this report, the average freight car makes a repair track movement on the average of about once every sixty days, which is surprisingly often and a real source of car delay. It is obvious that during the present emergency when maximum car utilization is imperative, some means must be found to reduce the frequency of these visits to repair tracks and also minimize the time required for actual repair operations so that the cars can be returned to service with no more delay than absolutely necessary.

New cars in general embody improved engineering designs and materials well adapted to stand ordinary usage over a long period and any failure to utilize quality materials in car construction is false economy. Since a large percentage of car detentions are caused by truck failures, including wheel defects, broken brake hangers, etc., the necessity of giving particular attention to these parts at interchange inspection points is, of course, apparent. The A.A.R. Mechanical Division has issued instructions which cover this, as well as other details of car inspection and maintenance and careful following of the instructions given and rules laid down will go far to improve freight-car conditions and promote a higher degree of car utilization.

The hot box is, as always, a prolific source of car delays and the superintendents claim quite naturally, and in some cases no doubt accurately, that the average car inspector attributes waste grabs and attendant hot boxes to rough switching and rough track when often the real cause is packing placed too high in the journal box, use of inferior reclaimed waste, or oil. A.A.R. Rule 66 has probably made as great a contribution to improved journal-box conditions and the reduction of hot boxes as any other single factor and there is still some work to be done in securing more general and all-inclusive adherence to this rule.

Other points, strongly emphasized in the superintendent's report were the need for prompt handling of cars at wheel tracks and cleaning tracks, due attention to the material situation to make sure that cars are not delayed by lack of necessary repair parts and the education of car inspectors and repairmen with periodic checks of their physical condition, including vision. Special efforts should be made to encourage and develop good judgment in car inspectors and skilled, careful workmanship in car-repair forces, so that cars will be sent to the repair track only when absolutely necessary and then receive expeditious and adequate repairs which will permit them to give another reasonable period of satisfactory service before requiring further mechanical attention.

The inspection of trains and cars is a 24-hr. job which requires, among other things, the best of lighting facilities to discover hidden defects and it is sometimes advisable to work two shifts of car repairers, with the night shift to look after loads principally. These combination car-repair men and inspectors can be used to augment the inspection force when necessary and thus help keep the cars moving.

A Challenge of Total War

"There was a time when I knew that certain items that we were not getting were going to industries that I thought were not very essential. At that time we never let up for an instant in trying to get even more than the railroads had asked for. But we know now where these materials are going and we know especially in the railroad items how directly competitive they are with military necessities both in army and navy equipment."

Thus, in his address at the railroad sessions of the American Society of Mechanical Engineers at Cleveland on June 10, did Andrew Stevenson, chief, Transportation Equipment Branch, War Production Board, state the reason why the railroad industry has been disappointed in the number of new cars and new locomotives it has been able to secure during 1942.

The statement that this is a total war has been reiterated so many times that it is becoming trite, and yet its full significance is only beginning to be apparent. In a total war production and internal transportation are as much a part of the war effort as the military operations in the field.

Mr. Stevenson pointed out the similarity in the character of the products needed by the railroads and those in demand for the production of army and navy equipment. He might well have included also merchant shipping, for more and more of which we are

now in desperate need to insure the success of our entire war effort.

Great risks have to be taken in the prosecution of a war. High factors of safety are seldom assured in the conduct of military operations. It is only a normal risk of war, therefore, if the railroads have to face their part of the national wartime task with fewer new cars and new locomotives than are needed to maintain the customary factor of transportation safety during the prospective fall traffic peak. Certainly, the factor of safety in shipping at the present time is far worse than that of the railroads.

This is a challenge of total war to which railway men can and will rise.

Is the Risk A Reasonable One?

It is evident that as the year advances the customary factor of safety with respect to freight motive power, as measured by the highest past statistical average intensity of the motive-power utilization, is going to be considerably reduced. One convincing evidence of this lies in the fact that during the month of March—the latest for which the data are available, freight-locomotive mileage of the Class I railroads had already exceeded that of last October by one per cent, and the average freight locomotive-miles per day of 24 railroads exceeded 100 miles, while in October only 20 railroads were in the 100 miles or better, group.

What are the prospects that the present motive-power supply will be able to measure up to the higher utilization rates required next Fall?

In considering this question it is well to take into account certain aspects of the history of the steam locomotive. One need go back but little more than 25 years to reach a period when the steam locomotive was not considered capable of running more than 100 to 125 miles without complete servicing, and repairs such as rolling in flues or one or more jobs on the motion work or running gear. Then certain railroad men with more than the average faith in the capacity of the steam locomotive for better things risked their jobs in demonstrating that it was only well warmed up to its work at the end of 100 to 125 miles. Going a few years further back, the locomotive was hardly expected to run non-stop more than 25 to 50 miles between ministrations of the engineman and his long-spout oil can.

Despite the fact that, today, these limitations have all been greatly extended by the development of mechanical lubrication, by the improvement in water conditions and boiler construction, by mechanical improvements, and by systematic attention to running repairs at monthly inspection periods, the steam locomotive is still to a very considerable extent the victim of its early history. That this is true is indicated by the results of a number of endurance tests to which freight locomotives were subjected some twelve to fifteen years ago.

On August 13, 1929, Engine No. 4113, a Mikado type freight locomotive on the St. Louis-San Francisco, completed a 25-day period of continuous service without dropping the fire. The locomotive was under steam continuously for 587 hours, during which time it made 7,350 miles. A year later, on the same railroad, another freight locomotive, operating in the same territory, between Kansas City, Kan., and Birmingham, Ala., was under steam continuously for a complete 30-day period, during which time it made 9,700 miles.

These tests developed no phenomenal mileage—the average during both was not far from 300 miles per day. During the second of the two tests, while the locomotive was under fire continuously for 740 hours, the time on the road was only a little more than 460 hours—a daily average of approximately 15 hr. on the road and 9 hr. at terminals. Since the average time of cleaning fires at terminals and intermediate points on the runs was 25 min., it is evident that these locomotives could have spent several more hours per day on the road had they been needed.

Another endurance test was made on the Northern Pacific in 1926 when a Mikado type locomotive, No. 1844, ran from Seattle, Wash., to the Twin Cities freight terminal on a freight train, a distance of 1,897.6 miles without being uncoupled from the train. This was a continuous movement of 109 hr. 30 min., during which the locomotive was fired with four different types of coal and the boiler was supplied with several different types of water, some of them foamy in character. Total terminal delays en route were 4 hr. 43 min., an average of 19 min. at each division terminal. At the end of the run the inspection disclosed nothing requiring repairs or mechanical attention.

These tests confirm the experience of more than one railroad that, given a high standard of maintenance, kept up systematically at the time of the 30-day inspections, freight locomotives are quite capable of road service averaging considerably better than 20 hr. a day if the volume of traffic and arrangement of schedules permit the requisite frequency of dispatching.

It would seem, therefore, that the risk involved in the inability of the railroads to increase their supply of freight locomotives in proportion to the increase in traffic demands is a reasonable one.

This answer, however, is contingent on one important condition. That is, that there be no letdown in keeping up the present high standards of locomotive maintenance. In this connection, it is significant that Messrs. Eastman and Stevenson, in their addresses before the American Society of Mechanical Engineers, both indicated that they had this point very much in mind.

To lower the factor of safety further by a failure in the supply of materials needed for this purpose would create an unreasonable risk sure to be the cause of unfortunate results.

War Production In Railroad Shops

The subject of the utilization of railroad shop facilities for the production of materiel needed in the arms program has been under discussion for some time and it is now reaching the point where there is some criticism, by inference at least, of the fact that the potential manufacturing capacity represented by the machine tools and shop equipment of the railroad repair shops have not, before now, been used in the production of goods now being made in new or converted plants. In other words, it is asked by some critics, why have the excess facilities of railroad shops been allowed to lie idle while new plants have been built and new facilities installed in them?

If there is any argument at all it would seem to revolve around the conception of idle facilities or excess capacity as related to railroad shops. What is the excess capacity of a railroad shop—is it represented by idle machines, or idle men, or what? No one familiar with railroad shop work will deny the fact that there are many machine tools in almost any large shop that are idle some part of the time that the shop is working; there are many operations in locomotive repair work, especially on the larger machines, that are of such nature and in such relatively small volume that there just isn't enough to absorb the capacity of the machine. Some of the big wheel lathes, quartering machines and boring mills are in this category. Then again while it is true that most of the facilities are used for one full shift and a large part of the facilities are also used on a second shift the third shift probably finds most of the shop facilities idle part of the time. Here then, as far as machine hours is concerned, is some excess capacity but production is not achieved by machine hours alone—man hours are needed to round out the picture. And, in the race between the armed forces, war production industries and the railroads for skilled shop men the railroads have come off a poor third.

Most of the war production industries have solved a large part of the problem of the demand for man-hours by the installation of modern high-production machinery which can turn out quantities of machined parts far in excess of the general type of tools found in railroad shops and those parts will meet a standard of accuracy in most cases that can not be met by the average railroad tool.

There would be no point in carrying this discussion to great length, for even a comprehensive analysis of the problem would result in the same ultimate conclusions. If industrial production of any type is wanted there are certain things that are absolutely essential—a plant structure, plant facilities, an adequate labor force and an efficient management. For the job of repairing the locomotives required to keep the railroads running at present high levels the railroads seem to be equipped in all important respects with the essentials to do that kind of a job. If, for example, a contract to build a thousand field guns or a thousand tanks were handed to any railroad shop in this country it's a reasonably safe bet that the job couldn't be done, along with the present output of locomotives, without installing additional shop equipment or hiring additional skilled men. There are, however, many shops that might take a substantial volume of sub-contract work and work it in on the first and second shift periods of present operations without adding greatly to either facilities or labor force. But, when it comes to third trick operation we are faced with the fact that the machines are there but the men to run them are not.

The production capacity of present plants, with present labor forces, can be materially increased by the installation of modernized facilities, many of which can even now be secured on reasonably short deliveries. So, to end all discussion of this question let's find out what it is that is now needed that can be done with the railroads' existing production capacity and get busy and do it. At the same time it is worth remembering that the railroad shops can turn out almost any kind of a job of a character for which they are equipped if they are given the few added facilities or men to increase output with present forces or absorb machine hours that are now idle. But in any contemplated program it will be dangerous to forget the major job for which they exist—to supply motive power and rolling stock for any traffic demand, whatever it may be.

New Books

MACHINE TOOLS AT WORK. *By Charles O. Herb. Published by the Industrial Press, 148 Lafayette St., New York. 544 pages, 6 in. by 9 in.; 434 illustrations. Price, $4.00.*

This book deals throughout with machine tools in action, and shows actual examples of shop practice selected to illustrate a wide range of applications. The 434 illustrations represent jobs on a large variety of the most modern types of machine tools, such as are used for turning, drilling, milling, planing, grinding, broaching, etc.

All operations of the same general character are grouped together. For example, one chapter contains operations on lathes of the ordinary type; other chapters feature turret-lathe operations; thread cutting with dies; tapping operations; drilling and boring with standard and special machines; planing, shaping, and slotting operations; milling, broaching, grinding, and honing as well as gear-cutting and miscellaneous jobs.

Close-up views show not only the actual machining operations, but the tooling, work-holding, and other auxiliary equipment.

This book is intended not only to supplement a shop or school course, but also to provide a general work of reference covering the practice in many classes of thoroughly modern shops.

Great Northern

Car-Shop Devices

By P. P. Barthelemy*

Shop-made labor- and lift-saving tools which help speed up freight-car repairs

THERE has never been a time when so much depended on efficient and expeditious action on the part of all car-department employees. We are apparently doing quite a good job; however, we must further exert ourselves for a still better performance, so it can never be said that the car department did not contribute its full share toward winning the war.

Because of labor and material conditions prevailing, which will most certainly become much more critical, a great deal of forehandedness is necessary. Thorough organization and the much wider use of labor- and time-saving devices are highly important. The repair material situation is also one that calls for careful planning, with much more economical use of new materials by well-developed and effective reclamation and repair programs. Much ingenuity must be exercised in making satisfactory substitution for, or repairs to, defective old parts where new replacements are ordinarily made.

Watch your scrap piles carefully; many reclaimable castings find their way there, as do also miscellaneous structurals of various sizes and lengths, small plates, both new and second-hand, that can be used instead of new. In repair work calling for short sections of structurals or plates, reclaimed materials can generally be used, since it is not always important that they be exactly to the dimensions of the part they replace. Truck sides, truck bolsters, couplers, knuckles and yokes are among the most frequently used items in large steel castings and on which extensive reclamation is possible. Draft gears, brake beams, journal boxes, wedges and bearings are other items on which an effective material saving can be made, and if reclamation is intelligently handled their use will result in no increased service hazard.

The freight car is still the main spring in the transportation of war and other bulk materials, and it is a fortunate circumstance at this critical time that the service condition of freight cars in general is at the highest peak ever attained. There are exceptions, as evidenced in our through trains by an increase in the number of old "pelters," cars evidently drawn from restricted use or temporary retirement, and pressed into service to help out the war transportation effort. The intent is commendable, but why were not such cars placed on repair tracks, given a thorough inspection and conditioning for service prior to such loadings? A train, like the proverbial chain, is no stronger than its weakest link. Cars loaded with important defense materials are found with such critical defects as old breaks in center sills; body bolsters with old breaks in critical stress areas; draft members in poor condition and draft gears

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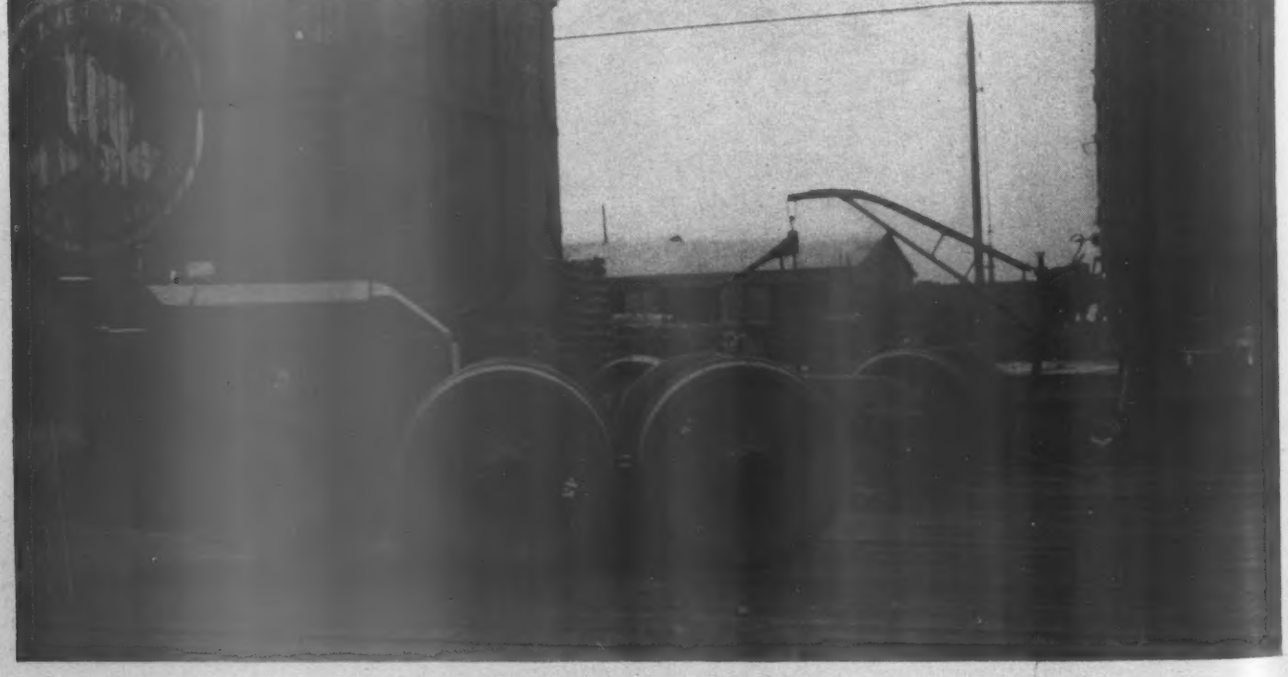


Fig 1—Electric lift truck for handling car wheels

Fig. 2—A wheel dolly for moving car wheels across the track

broken and worn out; couplers badly worn; trucks in poor condition and other items. These fifth columnists should be properly conditioned for heavy train service or relegated to their proper place, as surely with all the good cars we now have, the use of these hazardous individuals in important trains can and should be avoided.

Keep the trains rolling without avoidable mechanical interruptions. See that cars are in operating and commodity condition prior to being set for loading. This feature has been stressed for some time, but in some quarters, at least, there is room for improvement, particularly on cars to be loaded with long-haul materials, and very much so if such haul is to be over rugged mountain territory. The car once loaded must be kept moving and not delayed for mechanical defects. This is where the good car inspector shines, for he's the lad on whom we must depend. Levelheaded judgment, based on knowledge and wide experience, is necessary in making his decisions and in keeping cars moving. Any novice can slap on a lot of bad order cards and gum up the service, but your good inspector is the one who knows when not to bad-order a car. Most of that knowledge must come from extended active service and cannot be acquired in a few weeks of intensive training.

On our heavy, long-haul fast trains, where most of the cars in the train are destined to terminals 1,000 to 2,000 miles distant, in which case some bad orders in transit are to be expected, a comprehensive inspection and emergency repair plan is necessary. There are key points where some cars are set out and others picked up. The inspection at such points must be thorough, and loads tagged out should be promptly switched and set on repair tracks for immediate attention. If possible get these cars back in the same train, especially when there are only two or three such fast trains a day. In order to do this fast, co-ordinated work, it may be necessary to have a second, possibly a third-shift rip-track force. When not on emergency work, these shifts can do routine repairs. The plan works out very well, and, although it has some obvious drawbacks, it helps "keep them rolling."

An extremely important feature in the ordinary train yard that is a great help in avoiding setouts is thoroughly organized yard repairs, handled directly in conjunction with train inspection. Besides such ordinary work as changing brake shoes, etc., there is a large number of repair items that can be handled if proper facilities exist, and if adequate preparations have been made. These include brake pins, brake hangers, air hose, a variety of vital bolts and nuts missing, rebrassing, journal box attention, safety appliances, cotters, uncoupling devices, knuckle pins, hand brakes, train line repairs, etc. Necessarily, this is all fast work. Some of the more commonly used devices, such as brake shoes and keys, may be spread along the tracks and if carefully placed on the ties just outside the rail they do not constitute a hazard. In some yards, depressed material boxes with the tops flush with the yard surface, are used, although in many instances water and ice make these impractical. Several neat and compact material racks located outside the yard or at viaduct piers are necessary so that the required part may be quickly obtainable. Paint-spotting rails across the yard opposite each material rack enables yard repair men to locate it quickly.

Such racks should preferably be of steel, well painted, with good doors, preferably sliding to save room. The interior should be painted a light color and must be well arranged with ample shelving and space for jacks, large bars, etc. The material in all racks should be of uniform arrangement and the different pockets marked for size of item as far as possible. There must be a daily check of these materials racks, at which time replenishing must be done to keep all items fully stocked. Thorough supervision of yard inspection and repair work is imperative, and, in case of very important trains, it is well to have a supervisor present to back up the inspectors in making critical decisions.

The rip track is an important factor in keeping the cars

Fig. 3—A portable jam riveter

moving, and its personnel, organization and equipment must be given the attention they deserve. It must not be looked upon as just a place where, somehow or other, wheels, couplers, draft gears and a hundred other items are handled. Loads must be immediately repaired, and the prompt repair of empties helps save many service-car-days. To accomplish these ends, rip tracks must be well equipped with the best tools and devices for that class of work. Necessary materials must be on hand and must be kept convenient and in an orderly arrangement, so that there will be a minimum of lost motion in getting it where it is needed.

The prompt handling of emergency repairs, as well as others for that matter, particularly on foreign cars, requires far-sighted preparation as to repair parts, and often a considerable amount of ingenuity in making an effective substitution when the exact repair part is not on hand. Those in the East and Central districts, where neighbors are many and nearby and borrowing of material is easy, do not realize the disadvantage of the fellows located in the Northwest, where large interchange points are few and far between, and where, therefore, Smith and Jones cannot readily borrow materials from each other.

Some of the rip track layouts seem to have "just happened" as there is little evidence that plans were checked by competent car department officers. Rearrangement of unsatisfactory facilities should be made as opportunity affords. Tools and devices should be of a character to reduce manual labor to a minimum. All ordinary repair tracks are equipped with air tools and the indispensable cutting and welding torch. Motorized jacks for heavy lifts are great time savers.

An unbelievable amount of time and heavy manual labor can be saved and repairs to cars expedited by a wide use of special jigs and devices designed to be best adapted to local conditions. There are hundreds of these, large and small, in use at different repair points, but their concentrated use is far from being as general as might be expected. Too many are still doing things the hard way. There should be made at each point a careful study of local needs, and devices adaptable to local conditions be provided. For rip track work, where movements are usually considerable, lightness and easy mobility are essential.

Since wheel changing is one of the most frequent of the major rip track operations, and wheels constitute

Fig. 4—A light truss boom applied to the coupler at the knuckle pin hole for lifting truck parts

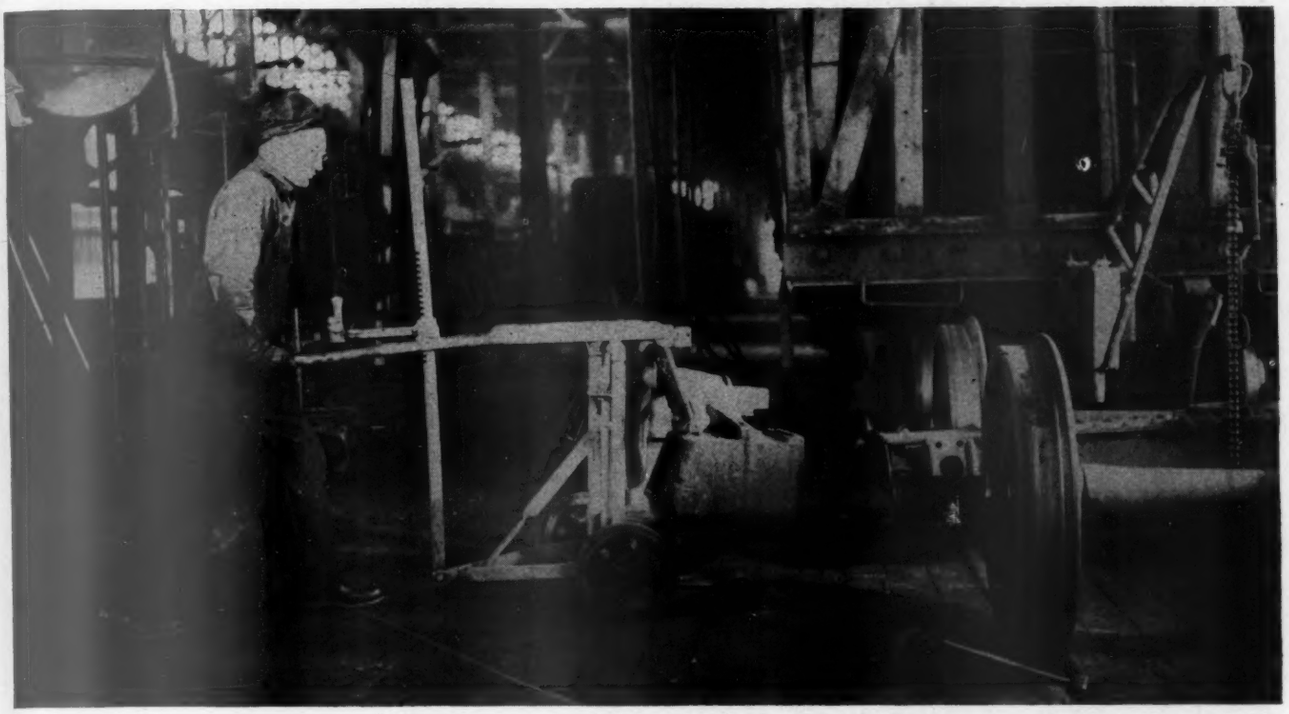


Fig. 5—A device for lifting and moving truck side frames into place on axles

the heaviest material item, handling facilities for these are important. For quick wheel changing, particularly where loads are handled, powerful easily transportable air-motor-operated jacks are essential. The transporting of the wheels from storage to the car must be quick and easy, as must also be the actual removal from the car of the defective wheel and the placement of the renewal. Standard-gage material tracks, where available, still constitute the cheapest wheel transportation, since there exists no more economical methods than rolling. A light, easily portable horse trestle, fitted with quick hoists for handling truck frames and bolsters, is another lift and time saver. Scooter dollies for taking the wheels from the truck to the service track, and the good wheels from service track to the truck are very helpful.

Turning of wheels on repair tracks should be avoided or reduced to a minimum. The use of the old crutch wheel stick applied to the journal, while almost universally banned, can still be found on some rip tracks. The collar crutch stick should also be banned for obvious reasons. A good general device is some form of cam or lever lift applied to the center of the axle. Air cylinders at regular turning points are effective, as are also some light turn-tables; where a large number of wheels are turned at one location live rollers at the inside of the turn with curved rail on the outside are highly effective but infrequently adapted to rip track layout. Rip tracks can be so laid out that, from the time a shipment of wheels is received until the bad order wheels are again loaded on the car, not a single turning operation will be necessary.

Other frequent and important rip track operations are coupler and draft gear renewals. The handling of the heavy draft gear is especially difficult. A light jack-operated rig, mounted on wheels and mobile, equipped with bracket for supporting gear, is very convenient for both removal and application.

Good light-metal devices such as ladders of various lengths, jack-horses, car horses, portable scaffolds, light air or other quick jacks for box repackers, easily portable riveting outfits with good light portable oil rivet heaters, and a variety of other devices, are great aids. Illustrations and brief descriptions of a number of shop-built time- and lift-saving devices and appliances, adapted to rip track or to shop work, are shown.

All rip tracks, except the very smallest, should have

Fig. 6—A pneumatic cam riveter

facilities for doing air-brake cleaning and A.A.R. Rule 66 Journal-box Packing, so that, when cars are set out for other repairs, these periodic repair items can be done, thereby saving near future setting out, and the consequent lost car service days, also avoiding old dates but, most important, insuring first class upkeep, eliminating train delays due to air failures and hot boxes. Since car mileage directly influences these items, their upkeep is of particular importance where cars are so intensively used and where so may are loaded with important war materials. These rip tracks should also be equipped for commodity conditioning and other comparatively light repair work, including washing cars in localities where that is required. A great deal of repainting can also be done, since with proper equipment such as mobile paint sprays and scaffolds and stencil guns, that work can be done as well and almost as cheaply as at shops. Handling such items on rip tracks

Fig. 7—A rivet heater which stands on the floor and extends inside a box car

not only keeps the force fully occupied, but is also a big help in maintaining cars to a higher standard and in increasing time intervals between shoppings.

General and Intermediate Repairs

While this article is devoted chiefly to inspection and running repairs, it would not be complete without a few words regarding general and intermediate work since the general condition of a car has a major influence on safety and continuity of train service. In some sections of the country, general requirements are such that cars, particularly box, must be shopped every 10 or 12 years in order to keep them up to high commodity condition requirements. In other sections, the demands are such that there is use for cars in practically all ranges of commodity condition, and under those conditions there is a tendency to neglect important upkeep items which result in too frequent set-outs of cars, usually under load, on account of failure of worn-out parts. Under those conditions, there should be a comprehensive program for intermediate repairs at proper intervals at which time trucks, draft gears, draft members and other parts vital to safe running should be given a thorough overhauling, thereby eliminating interruptions in train and car movements resulting from failure of these neglected parts, vitally important at this time and important at all times.

For general overhaul, a long-range shopping program should be worked out, one that provides for shopping cars as far as is possible during periods of lightest demand. Like cars should be put through in as large groups as possible, since, in that way thorough preparations can be made, cars put through stations; work specialized; and time- and labor-saving devices best adapted to meet requirements installed. Concentrating heavy work at certain shops may require diverting part of the ordinary work to other points. Any heavy-repair program undertaken should be thorough in order to fit cars for many years of uninterrupted serviceability, exclusive, of course, of ordinary wear and periodic items.

Handy Labor- and Lift-Saving Devices

In handling repair work, both on light repair tracks and in the shop, every practical means should be employed to expedite the work by making each operation faster and easier for the mechanic, take out the heavy lifts and eliminate heavy-lift hazards. For many years, we have made a sort of hobby of developing labor-saving devices that would accomplish this and also bring about a reduction in personal injuries. This plan has been followed, not only at major shops, but at all points even to the smallest rip track, so that these devices are not the brain-children of a single individual, and neither were they developed by the men at a single shop or rip track.

Supervisors, mechanics, and safety committees alike, have taken a keen interest in the matter and the results have been flattering. Mechanics like to use the easy way that eliminates heavy awkward lifts and hauls. Encouraging device suggestions from the mechanics doing the work is always good practice and a big help in bringing out new devices; it also helps build up the fellowship feeling so necessary in successfully carrying on the work. Invariably, there are a few mechanics on the job with an aptitude for working out trick labor-saving devices, and latitude should be given such men to exercise that ability. Accidents due to heavy lifts and other awkward heavy handlings have been reduced to a small fraction of what they formerly were. Most of these devices are original ideas adapted to local conditions; some were borrowed from other sources, even the automotive industry, and modified as necessary best to suit local needs.

In selecting or devising labor- and lift-saving equipment, there must be sufficient use to justify each. If for use other than stationary, the device must be easily and quickly transportable and quickly set up. Keep weight and size as low as possible consistent with safety, for easy mobility. Use light wheels of reasonable size with roller bearings so as to be readily handled about the shop by one man. Usually one pair of wheels, a pair of legs and bars for handling is the best arrangement. For the ordinary portable device, roller bearings can be made from small steel rods as the wear is negligible; take out the manual lift wherever you can. Use hose of minimum size to save weight, and, incidentally now,

to save rubber. Welded pipe lends itself best to the construction of most of these various devices. For safety's sake use new pipe. In working out labor- and time-saving devices, do not overlook the ordinary rip track. Be it a train assembly point or an intermediate terminal, the expediting of car repairs is of primary importance.

Special consideration is necessary if considerable distances must be covered; therefore, devices must have the highest degree of mobility and versatility. Often, also, there is opportunity for making rearrangements in rip track layout that would be comparatively inexpensive, but would be far reaching in future savings. A wide publication of handy devices, jigs, etc., of which there is a multitude, should be advanced by those having them. Again, don't forget the light repair track where the use of time savers will serve not only to expedite load repairs but will frequently be the deciding factor in saving another car-day.

Labor-saving devices, always essential, assume an importance of the highest order under present war and labor conditions, and no effort should be spared in adopting and devising special appliances adaptable to local conditions.

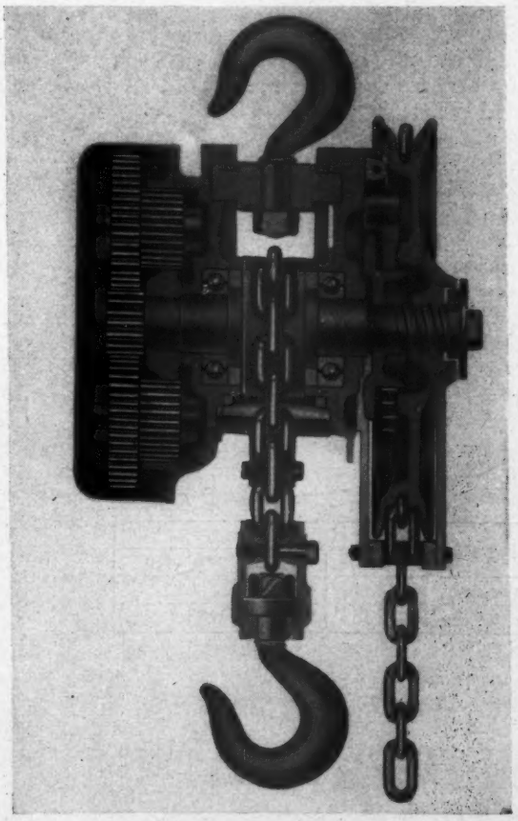
The light electric lift truck, which is shown in Fig. 1, is used in making deliveries of car wheels and carries two pairs of wheels at a time. This truck is very flexible in use, adapted to make short turns and is employed for a variety of purposes about the car shop and rip tracks. The wheel dollies, shown in Fig. 2 are used for moving car wheels from standard-gage service tracks or platforms, across to the track on which they are to be used without the necessity of turning and rolling the wheels. The dolly track is made of two 1¼-in. pipe sections, spaced 10 in. apart, by means of light plates welded to the bottom and serving as base plates. Multiple pipe sections may be joined end to end and give any desired length of pipe necessary for cross movement of the car wheels. The two four-wheel roller-bearing carriages, illustrated, support the car wheels and both the carriages and the pipe sections, when disassembled, may be mounted on a light two-wheel truck for easy movement about the shop.

The light boom, which is shown in Fig. 4, is made of welded pipe and is attached to the coupler by a pin through the coupler knuckle hole. By means of a Coffing chain hoist, this boom may be used for lifting truck bolsters and swinging them into position in the truck assembly. Bolsters are brought to the truck job by means of a light two-wheel roller-bearing carriage, which can be easily handled by one man. A special lifting device, shown in Fig. 5 is used for applying truck side frames. This device is equipped with rubber-tire roller-bearing wheels and the lift is made through multiple lever arms, the side frame being held at any desirable height by means of the ratchet arm. This truck is sufficiently mobile to be used in transporting side frames to and from nearby stock piles, as well as for lifting them onto the axles.

The portable jam riveter and punch, illustrated in Fig. 3, is useful for light riveting and punching jobs, particularly in connection with program work. The frame, of welded pipe, is mounted on large but light-weight roller-bearing wheels so that the unit can be easily moved about the shop by one man. The special portable cam riveter and punch, which is illustrated in Fig. 6, is suitable for light work, being especially designed for door weatherstripping in connection with program work and it can also be used for many other operations in connection with car repairs. This unit is mounted on light wheels of large diameter so that it is easily portable. The light rivet-heating forge (see Fig. 7) is built to extend into the doorway of a freight car and thus proves a great time-saver for handling interior riveting jobs. This forge also embodies welded tubular steel construction with roller-bearing wheels and two convenient handles for easy portability.

Speedy Operating Spur-Geared Chain Hoist

An improved, standard-type, spur-geared chain hoist is now being manufactured which is recommended for many applications in industry where a maximum amount of speed, safety, durability and efficiency is essential. This hoist, known as the Model Y-C, is equipped with a dust guard to protect the Weston-type brake from dust and dirt. Heavy suspension plates provide unbreakable support between top-hook crosshead and load sheave. These plates also directly support the saddle for double-chain hookup, a new feature in this type hoist, and eliminate the use of a top yoke thus reducing the weight and headroom and permitting the hoist to hang evenly at all times. The load sheave is mounted on two heavy precision ball bearings, enclosed and protected from dust and grit. The Model Y-C embodies other features and is built in six capacities, ½, 1, 1½, 2, 3 and 4 tons. The manufacturer, the Coffing Hoist Company, Danville, Ill., states that all hoists are factory tested at 100 per cent over their rated capacity and are guaranteed against defective material and workmanship.



Speedy operating spur-gear chain hoist

Reclamation of Air-Brake Hose

In view of the critical situation with respect to the supply of rubber, the A. A. R. Committee on Brakes and Brake Equipment has developed a method for reclamation of air brake hose as shown on the accompanying drawing.

All brake-pipe and signal-line hose, regardless of age, that have been sent to hose mounting plants must be carefully inspected for defects, as indicated under Rule 56 and Figs. A, C or E, A. A. R. Code of Rules for the Interchange of Traffic, and see that fittings pass the gages. Hose found to be satisfactory after being tested in accordance with the standard instructions shall be placed in stock for use on all equipment, including that in interchange service.

Hose, regardless of age, with defects as per Figs. A, C and E shall be carefully inspected for sections that may be salvaged for use in splicing hose in accordance with the instructions on the drawing. Spliced hose may be used on all equipment, including that in interchange service.

The Arbitration committee has also prepared the following changes in the Interchange Rules to be effective July 1, 1942:

Rule 9.—Modify first requirement opposite item "Air hose, applied" to read "New *or second-hand, or spliced per A.A.R. specifications.*"

Rule 56.—Causes for renewal of air brake hose. Modify Item 6 to read "Loose or defective fittings, either or both ends of hose, *or at joiner on spliced hose.*" Modify Item 7 to read "End of tube 3/8 in. or more from shoulder on either nipple or coupling, *or joiner on spliced hose.*"

Rule 57.—Modify first paragraph to read "Cars not equipped with A.A.R. Standard 1 3/8 in. air brake hose *or spliced hose per A.A.R. specifications.* For label *for new hose* see below.

Rule 62.—Modify first paragraph of this rule to read as follows: "In replacing air-brake hose on foreign cars, new A.A.R. standard specification hose *or spliced hose per A.A.R. specifications* must be used to justify bill."

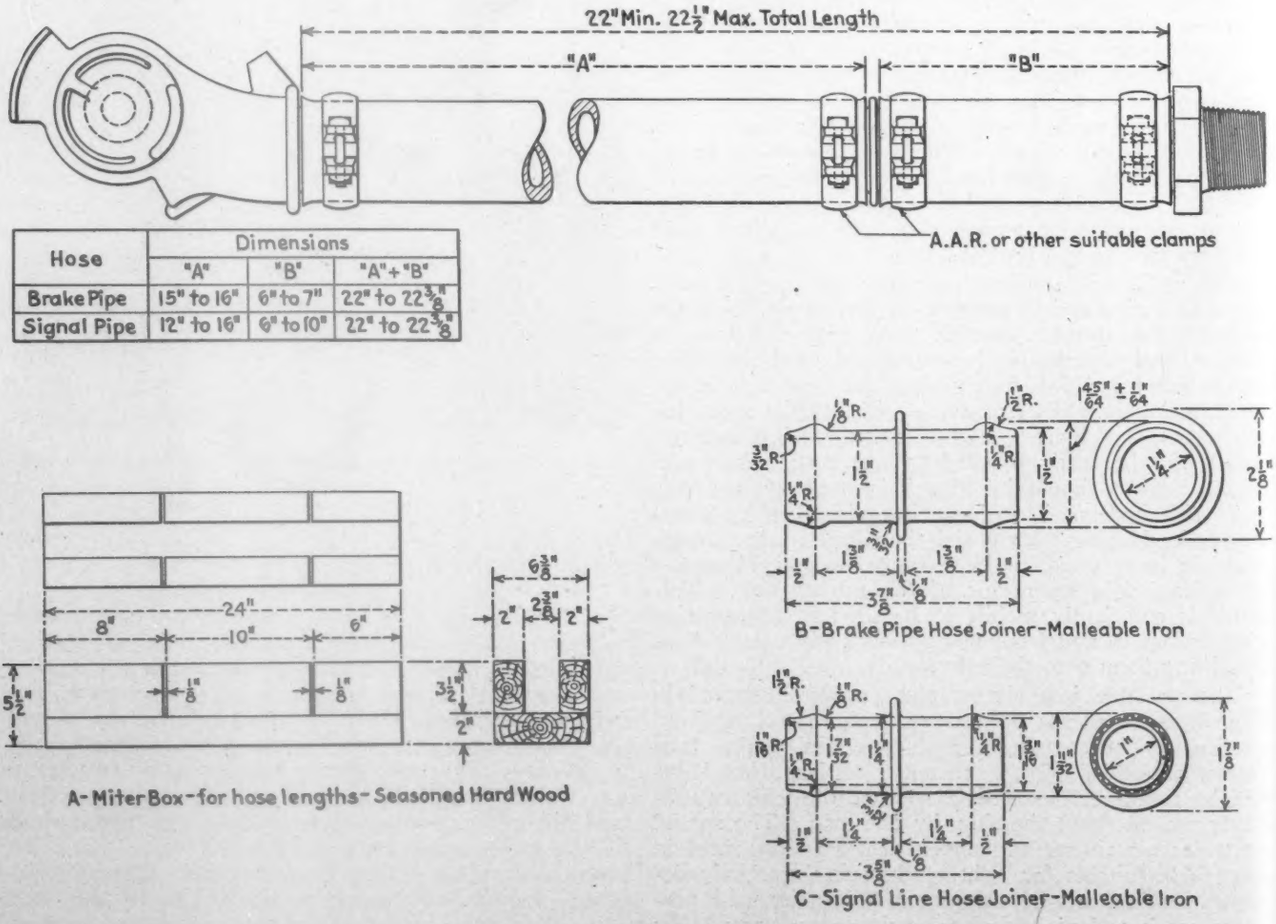
Rule 101.—Add new Item 1-A, to read: "Item 1-A. Air-brake hose, 1 3/8 in. spliced as per A.A.R. specifications, complete with fittings, applied to car, charge —— —— $1.39." Modify Item 2 to read "Air-brake hose, A.A.R. standard *or spliced per A.A.R. specifications,* average credit for fittings for same ———— $0.55."

Kind of Hose to Be Used for Splicing

All salvaged brake-pipe and signal-line hose regardless of age, providing the inner lining is in good condition and the sections do not have defects as shown in Figs. A, C and E of Rule 56 of the Code of Rules for the Interchange Traffic.

The method to be followed in the reclamation, by splicing, of brake pipe and signal hose is as follows:

(1) Place the hose section in a miter box *A,* constructed of seasoned hardwood and fastened to a bench to prevent warping.



Hose	Dimensions		
	"A"	"B"	"A"+"B"
Brake Pipe	15" to 16"	6" to 7"	22" to 22⅜"
Signal Pipe	12" to 16"	6" to 10"	22" to 22⅜"

Method of reclaiming air-brake hose recommended by the A.A.R., Mechanical Division

(2) Hold the hose section firmly against the side and bottom of the miter box to keep it straight and insure a square-cut edge.

(3) The hose sections should be cut with a knife-like instrument, experiments indicating that a 1⅛-in. by 14-in. hack-saw blade (similar to those used in power hack-saw machines) with teeth ground off and sharpened to a knife edge inserted in a hack saw frame, makes the best cutting instrument. The blade should be dipped in water to facilitate cutting and insure a clean edge.

(4) Malleable iron joiners, as shown at *B* for brake pipe hose and at *C* for signal line hose, are to be used.

(5) Exposed ends of the cut hose should be covered with rubber cement to protect the fabric from moisture.

(6) In mounting joiners, the same instructions governing the mounting of hose nipples and couplings should be followed.

(7) The bolts or fastening side of clamps should be placed in the same position, as shown for the coupling end of the hose.

(8) After splicing, all hose should be tested in accordance with standard instructions.

Packing Retainer Spring

A relatively simple and inexpensive design of packing retaining spring, developed recently by the Spring Packing Corporation, Chicago, is designed primarily to reduce the danger of waste grabs and materially reduce the labor cost of servicing railway car journals, both passenger and freight. The retainer is made of spring-steel wire applied in the front of the box so as to overcome the tendency of packing to work forward from under the journal, roll and climb up in front of the box and cause waste grabs unless constant care is exercised by car oilers to put the packing back in its proper place.

A front plug is sometimes placed in the box to hold the main body of the packing back, under and firmly against the journal, but unfortunately, the plug itself often works up and permits the balance of the packing

The packing-spring retainer applied to hold the packing in place

Conventional journal box with loose front packing which causes hot boxes

to become displaced. The new packing retainer spring, interchangeable in one size for both 5-in. by 9-in. and 5½-in. by 10-in. journal boxes, is applied on top of the front plug and extends around in back of the collar. In case a front plug is not used the main body of the packing is extended out to the front of the box and the spring applied over it.

When the two ends of the spring are placed in the hole in the end of the wedge, this applies a strong pressure which keeps the packing in the front of the journal box firmly in place, thus holding back the packing under the journal and keeping it in compression. Most rolling of packing starts at the collar of the journal and the new packing retainer spring is intended to prevent that condition from developing. The device does not interfere with the use of a packing iron to adjust the packing alongside the journal, nor does it interfere with oiling or inspection of the side of the bearing. If necessary to remove the packing the spring is easily removed.

Air Brake Questions and Answers

HSC High-Speed Passenger Brake Equipment

28—*Q.—What is the plug connector for?* A.—To join the wire connections between the axle generator and the relay cabinet.

29—*Q.—Where is the thermo flip on the switch located?* A.—On the first and last cars of a train for manual control of the battery supply.

30—*Q.—For what purpose is a contactor located on*

the first and last cars of a train? A.—To automatically cut out the battery supply circuit to the relay cabinet when the Diesel engine is detached from the train.

31—*Q.—What is the purpose of the back-up valve?* A.—Combined with a signal whistle and whistle valve, for control of back-up movements.

Piping

32—*Q.—How many continuous pipes extend from end to end of car?* A.—Three; brake pipe, straight air pipe, and signal pipe.

33—*Q.—What type cocks are used on the brake pipe at each end of the car?* A.—Either an angle cock or a brake pipe end cock with a self-locking handle.

34—*Q.—How does the handle position of the end cock compare with the angle cock?* A.—The same. The port is open when the handle is parallel with the pipe.

35—*Q.—What type cut-out cock handle is found on the straight air pipe on some cars?* A.—On some cars this cock is equipped with a locking handle, which must be depressed before the cock key can be turned.

36—*Q.—What kind of hose connections are used between the brake cylinders and the brake cylinder pipe?* A.—Armored hose connections.

Wiring

37—*Q.—How many wires are contained in the cable which runs from car to car?* A.—Nine wires are contained in this cable, eight of which are connected to the power unit.

38—*Q.—How are these wires designated?* A.—Referring to Fig. 16, they consist of (1) application wire *AA;* (2) release wire *AR;* (3) return wire *AB* for the 64-volt power unit battery; (4) B + wire for 64-volt power unit battery supply to the DE-1 back-up valve on the last car; (5) *AC* low-speed (*LS*) speed governor wire; (6) *AE* high-speed (*HS*) speed governor wire; (7) *AD* medium speed (*MS*) governor wire; (8) *AG* and *S1,* 32-volt car battery return wire; (9) *S1* — and *S1* + 32-volt car battery supply wire for speed governor control which extends from the first to the last car.

39—*Q.—How are the application and release wires connected?* A.—In parallel.

40—*Q.—What do they connect?* A.—A master controller on the power unit and the application and release magnets of the No. 21-B magnet brackets on each car.

41—*Q.—How do the magnets function?* A.—They are energized or de-energized simultaneously by the master controller to apply or release the electro-pneumatic are energized or de-energized simultaneously by the brake valve handle on the power unit.

42—*Q.—What do the speed governor wires connect?* A.—The respective magnets of the relay valve in parallel throughout the train.

43—*Q.—How do these magnets function?* A.—They are energized or de-energized by the speed governor relays to limit brake cylinder pressure in proportion to the train speed.

The No. 21-B Magnet

44—*Q.—Of what does the No. 21-B magnet consist?* A.—Referring to Fig. 1, it consists of a pipe bracket (*55*) and magnet valve body (*2*).

45—*Q.—How many pipe connections has the bracket, and what do they connect?* A.—Three—(1) To exhaust; (2) auxiliary reservoir; (3) straight air pipe.

46—*Q.—How many magnets has the body?* A.—Two magnets, wired to a terminal block with suitable terminals to a connector (*88*).

47—*Q.—How are these magnets connected?* A.—One magnet is connected to the application wire (*A*), the other to the release wire (*R*) with a common return (*C*) to return wire (*AB*).

48—*Q.—Describe the magnets.* A.—Each magnet has a coil (*20*) with an armature (*26*) and an armature stem (*27*).

49—*Q.—What does the armature stem control?* A.—Controls the positions of release valve (*62*), and application valve (*34*).

50—*Q.—What is the duty of the release valve?* A.—To open or close communication between straight air pipe and exhaust.

* * *

Above—The triple-valve repair room

Below: Flexible power-driven wrenches used in removing and reapplying triple-valve-cap nuts at the triple-valve repair room of the Denver & Rio Grande Western, located on the second floor of the Burnham shops at Denver, Colo.

Keep Them Running*

By Walt Wyre

In these days of maximum demand railroad supervisors have three valuable assets —men, materials and machines. Here are some suggestions for getting the most out of each

THE railroads are in a predicament that may be compared to a champion prize fighter, who, after a long period of idleness, finds himself pushing a paunch instead of packing a punch and suddenly forced to fight the toughest opponent of his career.

The depression period that preceded the present emergency was certainly poor training for the present job that the railroads have to do. The depression left them short of three essentials—men, machines, and material. Now, when needed as never before, other industries have hired the men, bought the machines, and acquired priorities on materials. Champions don't quit, and American railroads are champions in their field. The same ingenuity, determination, and ability that has characterized mechanical-department supervisors and officers in the past will be equal to the task of the present and future.

The job of getting maximum efficiency from men, machines, and materials is similar at every shop and engine house, but each will have some particular problem that requires individual handling. That being true, basic methods, together with illustrative examples rather than individual instances, is the aim of this article. This, of course, implies, but intentionally, ability and initiative of supervisors to apply these basic methods to individual problems.

For convenience and without attempting to evaluate relative importance, this article has three subdivisions—men, machines, and material.

Men

All men may be born "free and equal" but tax paying time leaves a doubt about the freedom, and the equality is erased by the passing years from infancy to manhood as any good shop foreman knows. Men differ in ability, temperament, and inclination. Supervisors who recognize this fact and act accordingly have less trouble and get more work done than those who do not.

"I treat all the men under me alike" is an expression often used by foremen. Fortunately for all concerned, it is seldom if ever true. Might as well say "I use the same procedure overhauling Diesel-electric and steam locomotives." There is often just as much difference in individuals as in the two types of motive power. This doesn't mean to play favorites—far from it; favoritism is a pitfall that has trapped many supervisors on an upward climb.

An example that is at least partially illustrative is a machinist we will call Jones because that is not his name, who is employed in a roundhouse. For years Jones was the bane of existence for every foreman. In that period of time several foremen came and went and each of them up to the present one had a lot of trouble with Jones. A coat of arms typifying Jones' disposition not so long ago would be a teetering chip on a sloping shoulder. Jones showed his resentment of frequent "bawlings out" by doing less and worse work than any other machinist on the job. In the machine shop he turned out fewer and worse fitting bushings than other machine men. On running repair he seldom finished a job in the usual time required by other machinists.

The foreman on the job before the present incumbent fired Jones twice, but each time was forced to reinstate the mechanic. The second time the investigation made it appear that Jones was discharged because of personal prejudice. Jones was well on the way to becoming what is known in army slang as a "gold brick." Almost every shop has one or more of the type.

When the present foreman came on the job, one of the first things he learned about was Jones. He has solved the problem accidentally or otherwise. The first few weeks after the new foreman came he said very little to any of the men and less, if possible, to Machinist Jones who was then on running repairs. The job of maintaining feed-water pumps and boosters became temporarily vacant on account of the man assigned being sick. The foreman called Jones into the office.

"Do you know anything about feed-water pumps?" the foreman asked.

"About as much as any of the other machinists," Jones replied truculently.

"How about boosters?"

"Guess I could get by on them," the machinist replied.

"All right," the foreman said, "I'm putting you on it temporarily. Here are the instruction books and blue prints."

The regular man was off longer than expected and did not return to work for over thirty days. In the meantime the foreman let Jones severely alone except through the medium of work reports and watched to see how he was handling the job. By the end of the month the foreman was forced to admit that Jones was doing a better job of maintaining the feed-water pumps and boosters than the other man had done. When the regular man returned to work he was persuaded to take the cab job which suited him exactly because it is lighter work and he hadn't entirely recovered from his illness. The feed-water-pump job was bulletined. Jones bid it in and is doing a good job on it.

The seniority system in effect on most railroads has in many instances placed square pegs in round holes and vice versa—good machine men on running repairs, good running-repair men on dead work, and so on. A situation of this kind requires diplomacy to handle without running afoul of labor organizations, but it can and has been done.

In one shop where the force was increased by bringing in men from a backshop that had reduced forces this condition was exceptionally bad. A number of men that had by years of experience familiarized themselves with

* An article submitted as an entry in the Prize Competition announced in the October, 1941, issue.

certain jobs were forced off them. This brought not only inefficiency but discontent, because men like to do things they can do well.

After a period of delays, failures, and overtime that was becoming increasingly difficult to explain, the foreman called the shop committee in and asked them to help him solve the problem. At first the committee refused to have anything to do with changing the men around, because they claimed it was tampering with seniority and seniority is sacred to most railroad men. The foreman finally persuaded them that it was as much to the interest of the men as to the company. The committee agreed on a tentative trial with the understanding that all jobs affected would be bulletined when and if requested. The result has been more and better work, fewer failures, less overtime, and the men are better satisfied than before.

Perhaps problems mentioned above do not exist in every shop, but the principle involved is applicable to some problem of personnel in every shop. College professors call it applied psychology, which is nothing but a six-bit word for a knowledge of human nature that is essential for getting cooperation.

Machines

If railroads had followed the prevailing practices of most industries of replacing machines as they became obsolescent, Japan's store of scrap iron would be much greater than it is, which is some comfort, but doesn't widen the bottle neck that exists in most railroad shops. A recent visit to shops and roundhouses in half a dozen states showed that new and modern machine tools are the exception rather than rule. Some supervisors will use this situation as an excuse for not getting the job done, but others will, like one foreman I know, manage some way.

There are practically no facilities at the small roundhouse where this foreman is located. The Diesel-electric switcher burned out an armature on one of the main generators. The master mechanic wired the foreman that an armature was shipped and to remove the damaged one and install the new one quickly as possible. At the time, the one and only available chain hoist was sent in for repairs. The foreman tried to borrow one but there was none available. It would take an extra day to have one sent from the nearest place. The foreman wired for a hoist, but didn't just sit down and wait. He hoisted the armature out—it weighs in the neighborhood of a thousand pounds—by twisting looped chains with a piece of pipe. The new armature and a chain hoist were received next day. You don't need a blue print to get the idea.

Perhaps conditions cannot be entirely corrected, but they can at least be partially overcome by one or more of four methods, usually a combination of all. They are: (1) Purchase of new tools; (2) repair or rebuild existing tools; (3) build tools; (4) get maximum efficiency from existing tools.

So much has been written and said about priorities that the idea prevails that there is no use ordering new machine tools. This is not true. The fact is it is just about as easy to get new machine tools now as it was a year or so ago, because then railroads didn't have the money and requisitions were seldom approved. Delivery may be slow and some machine tools unavailable, but one way to find out is to place an order.

Just a few weeks ago the general foreman of a shop placed an order for a tool-post grinder with an attachment for grinding reamers. He was pleasantly surprised to receive the machine in less than four weeks from the time he ordered it. It hasn't been so long ago that it took that long to get a requisition approved.

Keep machine tools in good condition. Good tools deserve good treatment, but poor tools demand it if they are to be kept in service. Too many railroad shop machines are treated like the Arkansas traveler's roof—when the machines are in use there isn't time to repair them and when idle they don't need it. In shops large enough to require a machine-shop foreman or lead man, one of the duties should be to see that machine tools are kept in condition for maximum production and to prevent unnecessary damage to the machine. A chipped tooth in a gear may, if not repaired, damage other gears and cause a breakdown at a time when the machine is urgently needed. Loose slipping belts reduce production and cause excessive belt wear.

There is an instance of worn gear shaft bearings in a lathe causing a lot of damage to the machine and a long wait for gears while the badly needed lathe stood idle. Every one in the machine shop knew the bearings were badly worn and the foreman was waiting for an opportune time to replace them, but opportune times are rare in roundhouses. The gears, not meshing properly, stripped, then new gears were needed as well as new bearings. Chances are lack of proper lubrication contributed to the bearing wear, but of course none of you readers would be guilty of allowing a machine to be operated without seeing that it was properly lubricated.

Next best to a new machine is an old one rebuilt and modernized. There are companies specializing in this type of work that will usually do a better job than would result from doing it in the local shop, and usually, because of experience and equipment for that type of work, they will do it at less cost. A lathe, drill press, shaper, and so on, rebuilt in a reputable shop specializing in that work will in most instances actually be a better machine than it was when originally purchased. However, whether sending it out or doing the work locally, complete rebuilding will in the long run prove more economical than constant patching to keep a machine running.

Use of proper tools properly sharpened will do a lot to speed up production in machine shops and in many instances reduce strain on tools and machines. Almost every mechanic thinks he is an authority on tool grinding, but it is surprising how few can grind a drill properly. A drill grinding machine or attachment for a grinder will save its cost in less than a year in many shops by preventing breakage of drills, to say nothing of increased production and better work.

In one shop a machinist helper lost so much time changing drill sizes that he was constantly snowed under. Perhaps he would be drilling a lining for a fire door when a machinist would come in with a rush job of drilling a $\frac{3}{16}$-in. hole for a cotter key in a bolt. It took longer to change drills, sleeves, and so on than the actual job. Then he had to set back again for the big job. A small machine, costing probably less than fifty dollars, was set up for handling drills $\frac{3}{16}$ in. and smaller. It requires little imagination to visualize what happened. Since installation of the small machine the drill-press operator has time to tap out nuts and chase threads on bolts—but now we are getting into material conservation, which comes later.

In addition to buying new machines, additional equipment may in some instances be built. Simple machines that do not require a lot of complicated machine work that will facilitate production may often be built in any shop. In fact, almost every shop has one or more homemade tools that are doing a good job. Rod carts, tire wagons, boring bars, various types of hooks, clamps, and other devices for handling sheet metal, pairs of wheels,

and a thousand and one home-made devices. No attempt will be made to give construction details of any one tool or machine that might be a valuable addition to your shop. Instead here is a tip that if followed will be of far more value.

Dig up all available copies of *Railway Mechanical Engineer* and if you don't have time, have some one make an index of all home-built tools described. Then from that index you can select ones needed in your shop and look them up in a few minutes. Where there are several points on a division under the jurisdiction of a master mechanic, files of the magazine could be kept at the division office and copies of the index sent to foremen at all points. This suggestion was made to the author by a general foreman some time ago.

A high-speed grinder mounted on one of the tool posts of a large planer was built at a mid-western shop and is used principally for grinding guides to produce a better finish. After the guides are planed true, cross-head gibs last longer and run cooler.

Now we have the machines—new, rebuilt, repaired or home-made. The job is to keep them running with maximum efficiency. Proper lubrication has been mentioned, as has use of proper tools, but both are important enough to be mentioned again. In many instances the machine-shop bottle neck can be considerably enlarged by using tools better suited to the job. This doesn't always mean buying higher priced tool steel, but merely the proper grade for the job it is to do. Almost any manufacturer of tool steel will be glad to send literature suggesting what grade of steel is best suited for certain uses. Carbide-tipped tools haven't been given a chance to show what they'll do in enough railroad shops. They will surely speed up machine work on cast iron as many shops have demonstrated.

Careful planning will reduce the start, stop, and go routine of machines in many shops. Sometimes an arrangement where a relief machine man works on dead work when not needed on running-repair jobs will eliminate lost motion and waiting. Sometimes three shifts in the machine shop will keep machine work ahead of two shifts on floor work. These are merely suggestions to stimulate imagination along that line.

Save that Material

The material shortage is getting shorter and prospects are better for it getting worse* If that's not clear, ask the storekeeper. He'll know what I mean.

Prevention of failure caused by broken rods, pins, etc., will, I believe, do as much as any one thing to conserve material. A broken main-rod swinging around can almost wipe the whole side of a locomotive clean. The remedy is proper testing periodically of rods, pins, etc. Magnaflux testing is perhaps the best method to follow. Whitewashing, using a mixture of whiting and alcohol, will reveal surface cracks. At any rate, every effort to forestall breakage is worthwhile and something more than an inspector with a mirror should be used to detect little cracks before they become big failures.

Every reader knows that out-of-round pins and journals cause lots of waste. Bearings must necessarily be made to fit the greatest diameter and they soon pound out. This is just a reminder that something should, if possible, be done about them.

Here are a few suggestions of what is being done in some shops to conserve material. A steel barrel is placed in a machine shop in which all broken drills, tool bits that are too short, etc., are placed. When a sufficient amount accumulates, it is sent in to the system store department. Thus it is prevented from going in with ordinary scrap.

A large bulletin board showing cost of tools and many other items is placed in one machine shop. Employees are thus reminded of money being wasted when material is wasted.

There are dozens of other ways of conserving material vitally needed for defense if space was available, but the idea as mentioned in the beginning was to stimulate thought rather than point out individual methods, and supervisors and officials of mechanical departments of our American railroads will do the rest.

* Some of the author's ideas on this subject are set forth in his story entitled "Gold Is Where You Find It" in the December, 1941, *Railway Mechanical Engineer*. Like those in many of his stories, the incidents mentioned are founded on fact.

Questions and Answers On Welding Practices

(The material in this department is for the assistance of those who are interested in, or wish help on problems relating to welding practices as applied to locomotive and car maintenance. The department is open to any person who cares to submit problems for solution. All communications should bear the name and address of the writer, whose identity will not be disclosed when request is made to that effect.)

Lengthening Drills By Welding

Q.—Is it possible to make an extension drill from an ordinary drill by welding? I have tried this but the drill always breaks in or near the weld. Could you tell me how it can be done?

A.—If the extension is being welded to an old carbon drill, no great difficulty should be encountered. However, welding high-speed drills to a long shank is quite another matter. Prepare both drill and shank as for any welding operation, that is, a flat double vee on both

High-speed drill aligned for welding of shank extension

parts. Never grind round parts to be welded to a point. If the drill and the new shank are the same size, lay them both in the trough of an angle to hold them in line while welding. If they are not the same size, place shims under the shank one half the difference of the outside diameter of the drill and the shank. The drill must run true. Place a cast-iron flux where it will be handy when needed. Adjust the welding flame so that

the feather of acetylene extends about 1 in. from the tip. Confine the heat to the area to be welded as much as possible. Heat the mild steel welding rod and dip it lightly in the cast-iron flux. Concentrate the flame on the vee. The drill and the shank, when starting to melt, do not have the usual affinity for one another. To overcome this hesitancy add the cast-iron flux to the tip of the welding rod. When the metal puddles, add the welding rod rapidly until one side of the vee is full. Do not work the puddle with the flame. The other side of the vee is then treated in a like manner. When the welding is completed, test the drill for straightness. If the heat is running into the drill far enough to endanger the cutting edge, dip the drill in water just far enough to protect the cutting lips. Do not cool the weld in any way. After the welded area has returned to room temperature, grind off the excess metal and polish the shank.

Worn Coupler Blocks

Q.—We have in our shop quite an accumulation of worn coupler-head blocks. These blocks are worn from contact with the end of the coupler shank. What is the most economical way of repairing these?

A.—Worn head blocks may be reclaimed by welding. A large size tip is used. The area around the pin is heated thoroughly and the worn space flooded full of wear-resisting bronze. After a little practice sufficient skill will be developed so that the resulting surface will require no further treatment. The bronze rod used for driving boxes works well for this application.

Keeping Bronze From Burning

Q.—When brazing heavy sections such as locomotive frames the bronze seems to burn and form a pulpy mass, yet if a smaller welding nozzle is used the flame is insufficient to bring the base metal to a tinning heat. What should be done to overcome the bronze burning?

A.—This condition usually occurs when one operator attempts to braze a frame or heavy section alone. In this case so much heat is required to keep the base metal at the proper temperature that an exceptionally large head must be used, when this large flame comes in contact with the welding rod, it is quite likely to burn it. To avoid this have a second operator hold the heat on the frame or heavy castings with a large tip or if another operator is not available fasten a wire netting basket to the part and keep a charcoal fire in it. By doing this it is possible for the actual welding to be done with a small welding head. In this way the bronze can be applied in the proper manner and will not lose any of its tensile strength.

Safety Solvent Replaces Naphtha, Gasoline, Kerosene

The Curran Corporation, Malden, Mass., has developed a hand-wiping safety solvent which is being marketed as a safety replacement for naphtha, gasoline, and kerosene. The solvent is applicable for industrial use as a naphtha substitute for grease cleaning and hand-wiping operations. It is marketed under its blanket trade mark of, GUNK XP-92; to be used as a concentrate and to be diluted with water.

In spite of its high solvency against mineral oil or dirt, this product does not de-oil the skin, has no toxic vapors, no flash or fire point, and leaves an invisible rust preventative film so thin it cannot be detected.

Sedalia Locomotive Shop Kinks

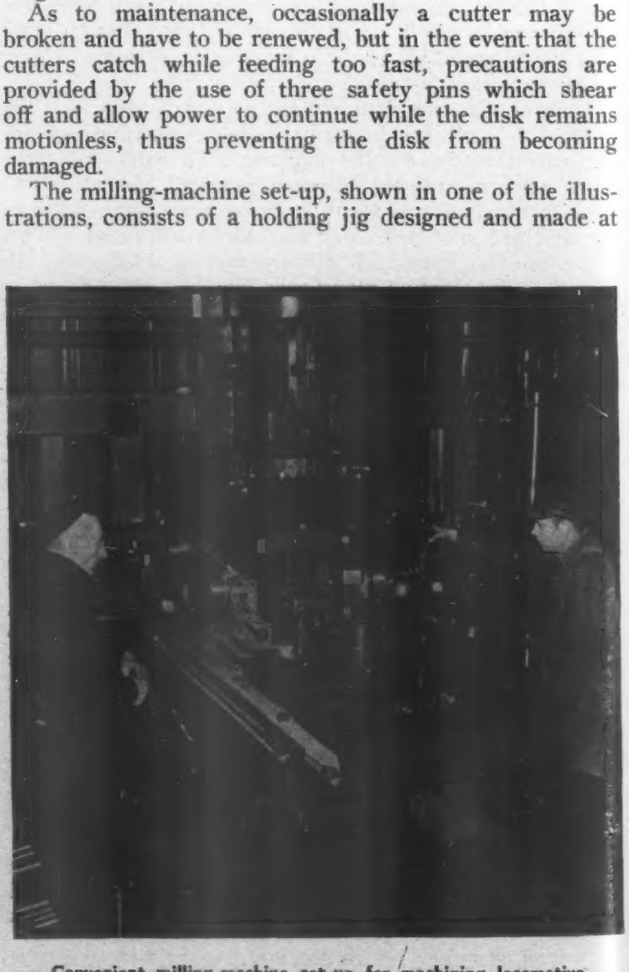
Output requirements for both system points and locally at the Missouri Pacific shops, Sedalia, Mo., necessitate a highly efficient means of maintaining production in a wide range of work. Improved tools and methods are always being looked for, even in the simplest machine operations with a view to increasing production and effecting economies.

For example, money is saved in cutting up steel bar stock with two cold saws, one of which is illustrated. This saw has a disk of 26 in. in diameter with 38 removable cutting tools or cutters; the cutters are grooved on the front bearing and a wedge insert grooved on the back bearing of the cutter. A special jig is maintained for the purpose of renewing the cutters and adjusting them. With a travel of 7 in., 14-in. stock may be handled, including steels, brass, etc. The filler blocks seen in the picture are 2½ in. by 9½ in. by 12½ in. These particular blocks were cut at the rate of 25 per 8-hr. day and are ready for use when taken from the saw. No chipping or grinding is necessary because the saw leaves a clean true finish.

Such stock as billets ranging in sizes up to 21 to 22 in., have been cut ready for forging outside rods. Scrap driving journals up to 8 in. in size have been severed in 15 min. or less, or cut into varying thicknesses, later to be bored out and used as washers. Four-in. angle iron is piled in stacks of ten, and is then cut to any desired lengths.

As to maintenance, occasionally a cutter may be broken and have to be renewed, but in the event that the cutters catch while feeding too fast, precautions are provided by the use of three safety pins which shear off and allow power to continue while the disk remains motionless, thus preventing the disk from becoming damaged.

The milling-machine set-up, shown in one of the illustrations, consists of a holding jig designed and made at



Convenient milling-machine set-up for machining locomotive driving boxes

Inspection table designed for convenient testing of locomotive parts and easy reclamation of the Magnaflux powder

the Sedalia shops to handle all sizes of driving boxes trailer boxes and tank boxes. A wide range of work of different character may be accommodated with different jigs and set-ups quickly and accurately by means of the slotted table surface.

The jig is built in four separate units, only one of which is shown holding the driving box which is being milled. The other jigs are at the other end of the table. Four boxes may be handled at one time. These are quickly set up due to the fact that each individual holding jig is centered on the table with two universal screws operating crosswise to the table, while another is lengthwise of the table. These universal screws coming in contact with the interior of the driving box will center it and the procedure of clamping the work down is achieved by tightening the rigid clamp bar which is held in readiness by a coil spring.

After having set up the work as described, thought is then given to the cutting feeds and speeds. A wide range of speeds is available beginning with the 16-in. spindle gear having from 12.1 to 128 r.p.m., or with a 12½-in. spindle gear ranging in speeds of 26.8 to 284 r.p.m. The corresponding table feed ranges from .367 to 18.7 in., with a rapid travel ranging from 18 to 42 in.

The milling of the shoe and wedge faces of 20 driving boxes per 8-hr. day with the oil grooves cut while the driving boxes are in this particular set up is considered the average output of this machine.

The Magnaflux Inspection Table

The sturdy inspection table, shown in one of the illustrations, is designed for convenient use and easy reclamation of Magnaflux powder used in the process of inspection. About 90 per cent is reclaimed by the use of this table.

The table consists of a 3½-in. by 5-in. wood frame standing 20 in. high and 14 ft. in length, with two 2-in. by 4-in. strips, containing the bus bars and running the entire length of the table. The slip-in plugs are spaced in a convenient manner. The table surface consists of a wire netting made in three sections, and easily removable. This netting is 1½ in. below the wood siding, allowing clearance for two movable notched stands. The stands are of 5-in. wood, reinforced with a ¼-in. by 1-in. steel band, and stand 15 in. above the table. The interior of the table is of ⅜-in. veneer boarding sloping 2 in. per foot from each end to the center opening where a drawer is located. The Magnaflux powder used in the inspection process falls through the screen

One of the two cold cut-off saws used at the Missouri Pacific shops, Sedalia, Mo.

and, at suitable intervals, the netting is removed and the powder brushed into the drawer at the center opening. In this manner it is reclaimed in large quantities, sifting it through the fine screen restores it to its original state.

Cooler, Faster Cutting With High Sulphur Oil

A castor-oil concentrate which takes more sulphur into solution than animal fats and from which a transparent cutting oil is manufactured has been developed by the Pawling Refining Corp., Port Chester, N. Y. The concentrate is obtained through a new process of distillation of castor oil which changes the molecular structure and results in a product which has "active oiliness." The heavy sulphur content increases the cooling qualities and allows for faster operation; the transparent nature of the oil permits observation of the cutting edge at all times, a great help in precision work and an important factor in obtaining longer tool life.

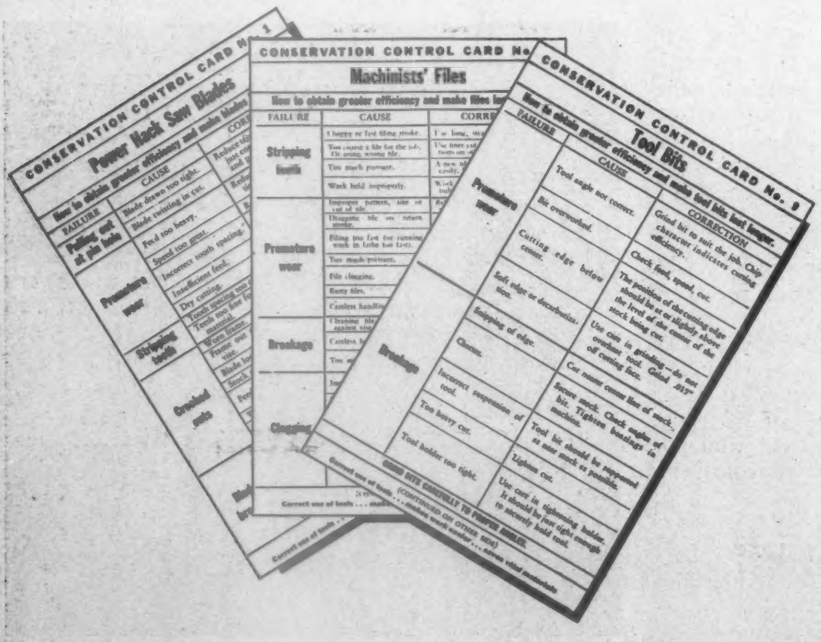
Disston Conservation Control Plan

In a nationwide effort to help American industry achieve the maximum in production with a minimum waste of time, labor and materials, Henry Disston & Sons, Inc., Philadelphia, Pa., has inaugurated a conservation control plan the basic idea of which is the instruction of workmen in the correct choice, proper use and the right care of tools. To make the instruction as sinmple, direct and effective as possible the company has devised a set of 35 instruction cards to be supplied to employees operating any one of 35 varieties of saws and tools. These cards are supplied without cost.

Each card contains concise, practical information that will lead to the most efficient and productive operation of the saw or tool covered by the particular card. There is a list of faults in operation, common difficulties and the usual mistakes in practice. The reason for each condition is stated briefly. The cards make it possible for the workman to choose the right tool for the job, see that it is set up properly, use it so as to prevent damage, keep it in good working condition and to perform his work with a maximum saving of time, effort and material.

The conservation control plan embraces the idea of the use of the cards as a valuable aid in supervision by having them distributed to the workmen by the department foreman who can personally demonstrate how the cards can be used as a handy reference in case of trouble, on starting a new job or as a check on a regular operation. The general use of the cards can serve to reduce tool breakage, cut material losses and improve production.

Among the subjects covered by the 35 individual cards of especial interest to railroad shop men are hack saws and metal cutting saws, band saws, inserted-tooth metal saws, tool bits, files of all descriptions, woodworking saws and friction discs.



Three of the 35 cards in the complete set showing the character of the instructive information for the use of shop employees

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

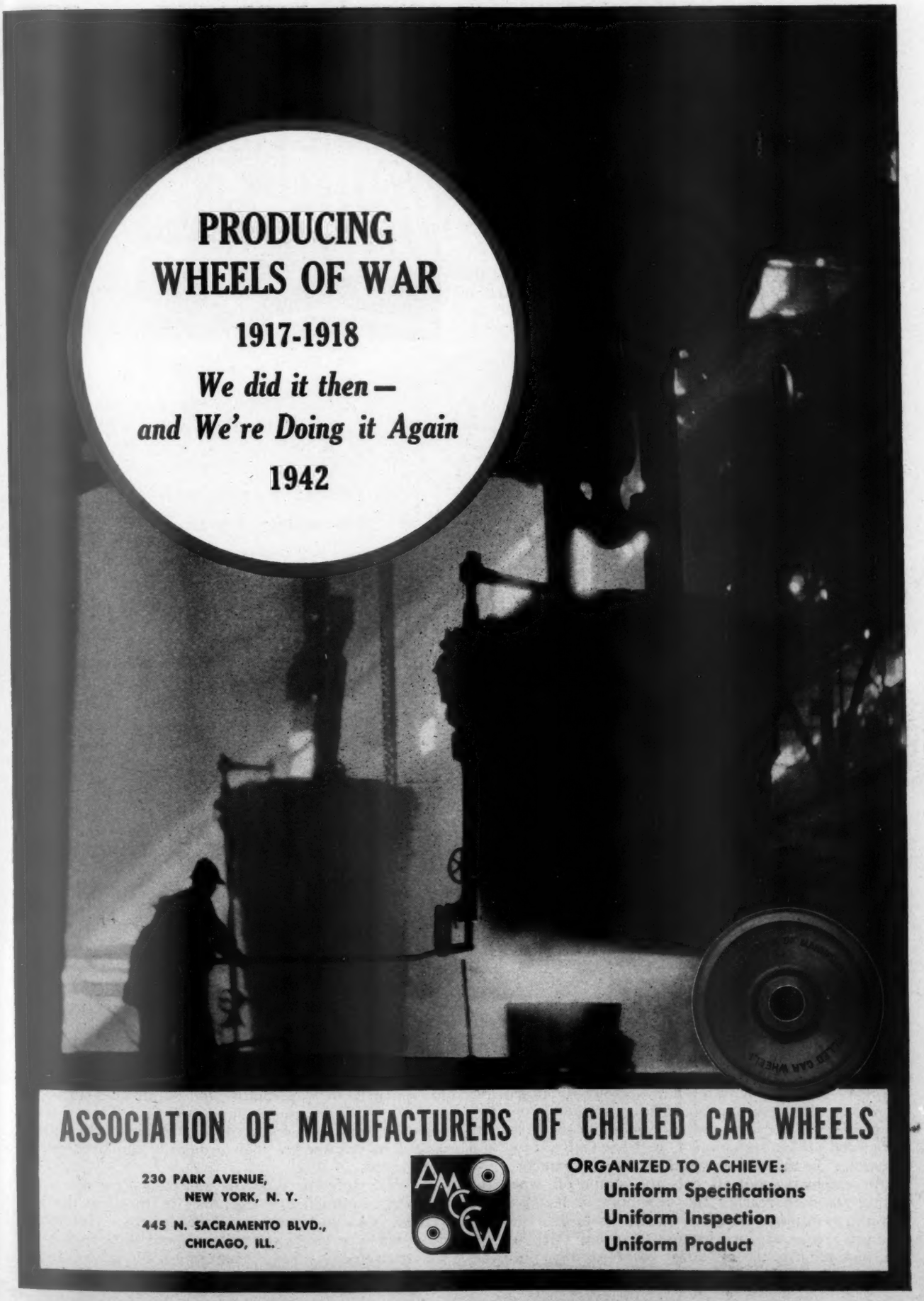
Calculating Booster Tractive Force — A Correction

In the February, 1942, issue a question concerning the tractive force of the booster was published, in the answer to which an error was made in the statement of the A.A.R. formula for computing the tractive force of a locomotive booster. The question was as follows:

Q.—What additional tractive force can be obtained by applying a C-2 booster to a Pacific type locomotive having a working pressure of 225 lb.?—M. I. C.

Part of the answer in question should have read as follows:

(*Turn to next left-hand page*)



ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

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NEW YORK, N. Y.

445 N. SACRAMENTO BLVD.,
CHICAGO, ILL.

AMCCW

ORGANIZED TO ACHIEVE:
Uniform Specifications
Uniform Inspection
Uniform Product

A.—The A.A.R. formula for computing the tractive force of a locomotive booster is as follows:

$$T = \frac{C \times P \times d^2 \times S \times r}{D}$$

where

T = tractive force, lb.
C = ratio mean effective pressure in cylinder to boiler pressure and is
.80 for 75 per cent cut-off booster
.73 for 50 per cent cut-off booster
.774 for 70 per cent cut-off booster
P = boiler pressure, lb. per sq. in.
d = diameter of cylinder, in.
S = stroke of piston, in.
D = diameter of booster driving wheels, in.
r = gear ratio

As printed in the February issue, the diameter of the cylinder in the numerator of the formula was stated as D^t. The remainder of the answer in which the application of the formula was illustrated by a specific example was correct.

Practice in Caulking Locomotive Boiler Seams

Q.—What is the general practice in caulking locomotive boilers? Should all seams be caulked on the outside only? What is the practice in applying studs to a boiler, should the studs be inserted into the sheet an amount equal to their diameter?—F. I. B.

A.—The general practice in caulking locomotive boilers is to caulk the longitudinal seams on the outside only. Circumferential seams and firebox seams should be caulked inside and outside.

The seam between the smokebox and the first shell course is caulked on the outside only. When a ring is used between the smokebox and the first shell course, caulk the smokebox to the ring and the ring to the shell on the outside only. All caulking edges should be beveled to 75 deg.

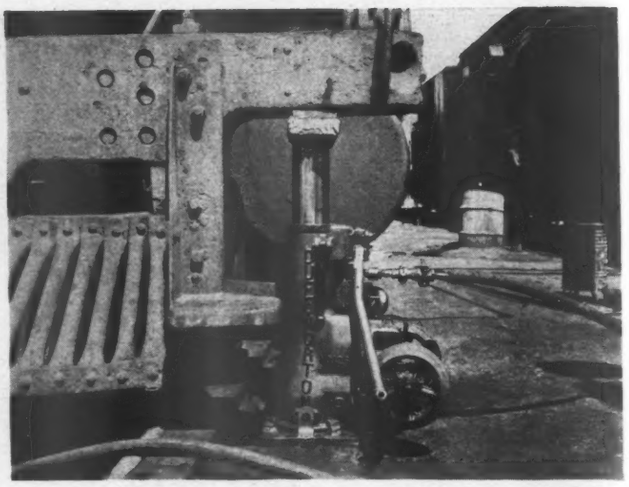
Boiler studs should be ¾ in. in diameter or over with the possible exception of the studs used for holding on the jacket supports. All studs should have tapered threads in the boiler, the general practice is to use 12 N threads (American Standard Threads) taper ¾ in. in 12 in.

To insure studs entering the sheet a sufficient distance, make the inner end of the stud at least flush with the inner surface of a single sheet, or liner when a liner is used. When applied in outside welt strips of a seam, the studs must extend in a distance at least equal to the diameter of the stud. In all cases the hole is to be gaged so that not less than one nor more than three full threads remain outside of the sheet after the stud is screwed in.

Power Jacks For Railroad Use

Improvements on its rotary air-motor jacks, making them faster and more efficient in operation, were announced recently by the Duff-Norton Manufacturing Company, Pittsburgh, Pa. The new motor operates 25 per cent faster with ordinary shop air pressures and a reduced air consumption. Used for both raising and lowering, the motor has a built-in exhaust muffler.

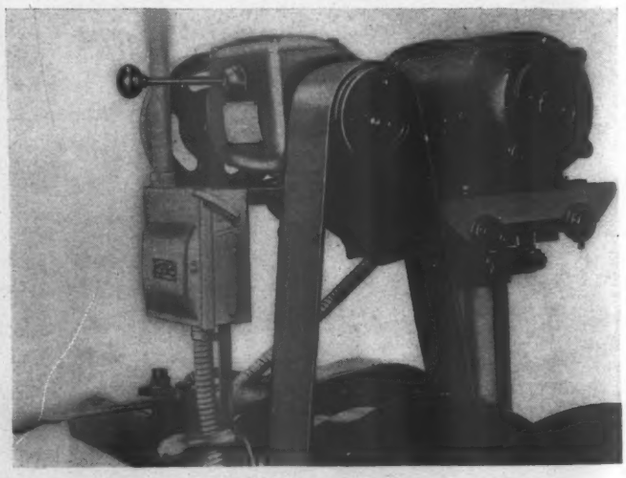
An automatic shut-off cuts the motor off when the lifting standard reaches the safe limit of its raised or lowered positions. A filter in the air-hose connection is easily removed for cleaning, assuring clean air for the motor. An up or down hand-throttle control is well guarded, with the lever position indicating the direction of operation. Rubber-tired roller-bearing wheels assure easy portability and spotting. The jacks are furnished in capacities from 20 to 100 tons.



A fast power jack

Individual Transmissions For Machine Tools

Transmissions are now available for converting old-style belt-driven machines to individually operated units using electric-motor drives. The Western Manufacturing Company, 3428 Scotten avenue, Detroit, Mich., has developed three units of different capacities which can be applied to almost all shop tools and adapted to the use of most types of motors. The Western Master is for use on 1- to 5-hp. motors, the Major on 5- to 10-hp., and the Super on motors up to 30 hp. This range of capacities makes possible the conversion of the largest as well as the smallest tools ordinarily employed in railroad shops.

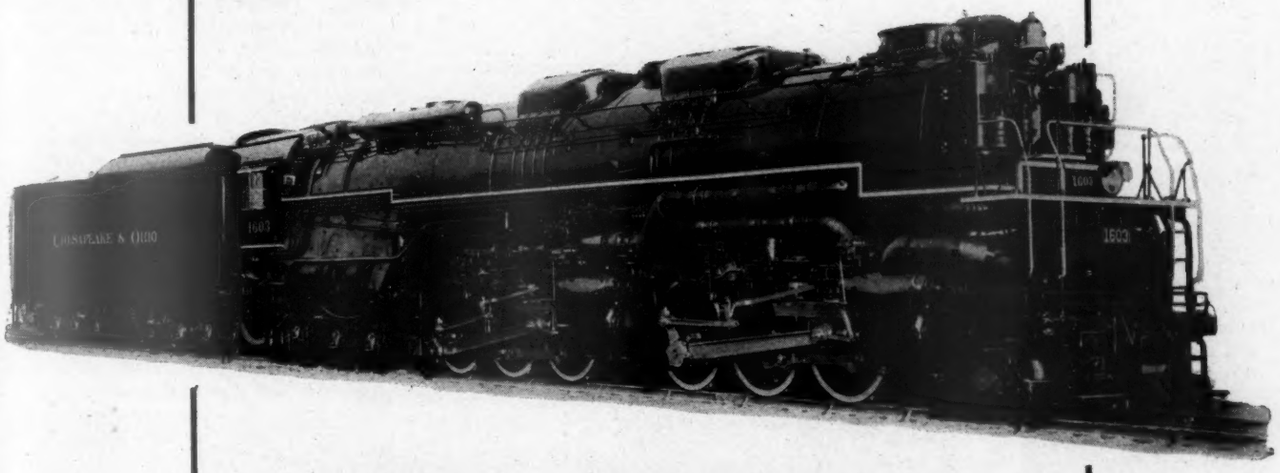


A Western transmission applied to a turret lathe which was formerly belt driven from a line shaft

Several different types of mountings are offered to suit the convenience of operators or to adapt the conversion units to various machine designs. Automotive gear-shift-type levers control the speed of operation and the transmissions have gear ratios of 1:1, 2:1, 3:1 and 4:1.

(*Turn to next left-hand page*)

The "Allegheny Type" LOCOMOTIVES



...of the Chesapeake & Ohio

The increasing demands that are being placed upon American Railroads are being met quickly and efficiently.

In anticipation of these demands the Chesapeake & Ohio purchased locomotives of a new and powerful design. These locomotives are the 2-6-6-6 "Allegheny Type" and the results being obtained are more than justifying their decision.

Lima is now building another lot of 10 of these same locomotives for the Chesapeake & Ohio which will be exact duplicates of the first lot. It pays to use Modern Power.

LIMA LOCOMOTIVE WORKS, INCORPORATED, LIMA, OHIO

LIMA
LOCOMOTIVE WORKS
INCORPORATED

High Spots in

Railway Affairs . . .

Oil for the East

There is danger that the spectacular effort that the railroads are making to rush oil to the east coast will steal the show from the remarkable all-out effort that is being made in moving wartime traffic, both freight and passenger. Week after week records in moving the oil are being smashed. For the week ended June 13, the last for which records were available when this was written, 731,520 barrels of oil were moved daily by rail to the east coast.

Vacation Travel

Vacations are desirable from the standpoint of public health, efficiency and morale. So declares Director Eastman of the Office of Defense Transportation. He does suggest, however, that vacation travel should be staggered throughout the year and that it be scheduled so that vacations will neither start nor terminate on weekends. A statement issued from the director's office on June 19 discourages the holding of conventions and group tours for the duration, if they are not closely related to the war effort. "If the American people," says Mr. Eastman, "will voluntarily impose certain restrictions upon their travel, there is good reason to hope that no drastic control over travel will be necessary."

Railroads Making Good

President M. W. Clement, of the Pennsylvania, makes very few public addresses, but when he does speak it comes right straight from the shoulder. In an address at the dedication of the new Technological Institute of Northwestern University he outlined at some length the accomplishments of the railroads in the present emergency. He pointed out that on a ton-mileage basis the railroads thus far in 1942 have almost doubled the record that they made in a like period four years ago. Near the close of his address he made this significant statement: "And, lest we forget—because it is the only industry so doing—all these improvements in the railroads, all this building up of their facilities, their engines, their cars, their capacity—all these millions—these billions—have been provided for entirely out of the funds of the railroads themselves. They have seen each of their subsidized competitors in difficulties under war conditions, while they themselves have gone on—a strictly regulated industry; a heavily taxed industry, moving without noticeable effort the largest volume of traffic they ever carried—fulfilling a destiny that could be accomplished only by the ingenuity of American transportation men and the industrial men allied with them. The railroads are handling wartime transportation, and handling it successfully and efficiently on the basis of their own resources. This is worth emphasizing because, today, when the thought is everywhere in the air that everything should be done by the government, we have here an outstanding illustration and proof of what private industry can accomplish."

Car Inspectors And Repairmen

Among the reports presented at the recent convention of the American Association of Railroad Superintendents was one concerned with securing the maximum utilization of freight cars. It pointed out that "the education of car inspectors and repairmen cannot be over-emphasized. Their physical condition should be checked periodically, with particular attention to vision. This applies to new men and those secured from other departments, as well as to the older men. Car department supervision should develop good judgment in car inspectors and skilled, careful workmanship in car repairers; otherwise cars will be sent to the repair track needlessly and repairs made that will not hold up. The inspection of trains and cars is a 24-hour job. Inspectors should be provided with the best possible lighting, so that hidden defects may come to light more easily. At many large inspection points carbide or electric lanterns with reflectors are furnished, but at most outlying yards and on interchange tracks the old-style oil lantern is still being used."

Railway Stations Modernized

Passenger cars and locomotives are not the only things on the railroads that are being modernized and streamlined. Old, disreputable railroad stations are being made over and ugly arrangements and finishes are being replaced by bright, pleasing fittings and attractive decorations. In some instances these are so designed that they cleverly disguise the fact that the original layout was too wide, or too high, or too long. It is interesting to note how the patrons react to these changes. The whole atmosphere and tempo seem to improve and speed up to conform to the new and snappier appointments. It is well that this is being done. The airports and bus terminals, all of them built within recent years, afford a distinct contrast to the old stations. Of passing note is the fact that the great two-and-a-quarter ton, wrought iron chandelier, which has hung in the second floor of the waiting room at the Union Station in St. Louis, which was opened in 1894, has been taken down and consigned to the scrap heap.

Cunningham Resigns

Railroaders are disturbed over the fact that Prof. W. J. Cunningham of Harvard University has resigned from the Transport Study Board to which President Roosevelt appointed him. He was to conduct an investigation on the relative economy and fitness of the various modes of transportation. The professor is saying nothing. Those who understand his high integrity and his ability to conduct such a study along scientific and objective lines cannot escape the belief that the dominating factor on the board, well known for his partisanship for a particular type of transportation, would not allow the professor a free hand in his studies. It is sincerely to be regretted that Professor Cunningham's services are not to be availed of, since an impartial report on this baffling problem is of first importance. If it is to be footballed about by partisans and self-seeking politicians, then the future looks bad—not alone for the transportation interests, but for the entire country, since its continued prosperity will depend upon developing that combination of transportation elements which will insure adequate transportation at a low unit cost.

Railroad Publicity

A railroad supply man complained the other day about the fact that the public did not appreciate the splendid record the railroads are making in handling the heavy wartime traffic. On the other hand, the public seems to be unduly critical about the little inconveniences it suffers, and particularly resents the lack of courtesy on the part of a few thoughtless railroad employees. Now, more than ever before, is the time for every railroad employee to be a booster, not only for his own road, but for the railroads in general. The vast sums of money being expended by the government to perfect automotive and air equipment for war purposes will, in part at least, redound to the advantage of the commercial carriers in the years to come. Meanwhile automobile and airway enthusiasts are predicting marvelous post-war improvements in highway and air transportation. According to airway enthusiasts, airplanes will become as plentiful as automobiles now are. Now is the time for the railroads to cultivate the goodwill of the public and have it thoroughly understand the part that they are playing in the present emergency. Incidentally, the railroads are not asleep, so far as expenditures for advertising are concerned, although they cannot compete with the automobile industry in this respect. According to the Association of American Railroads the expenditures of Class I railroads for advertising have been well in excess of 11 million dollars for each of the past three years.

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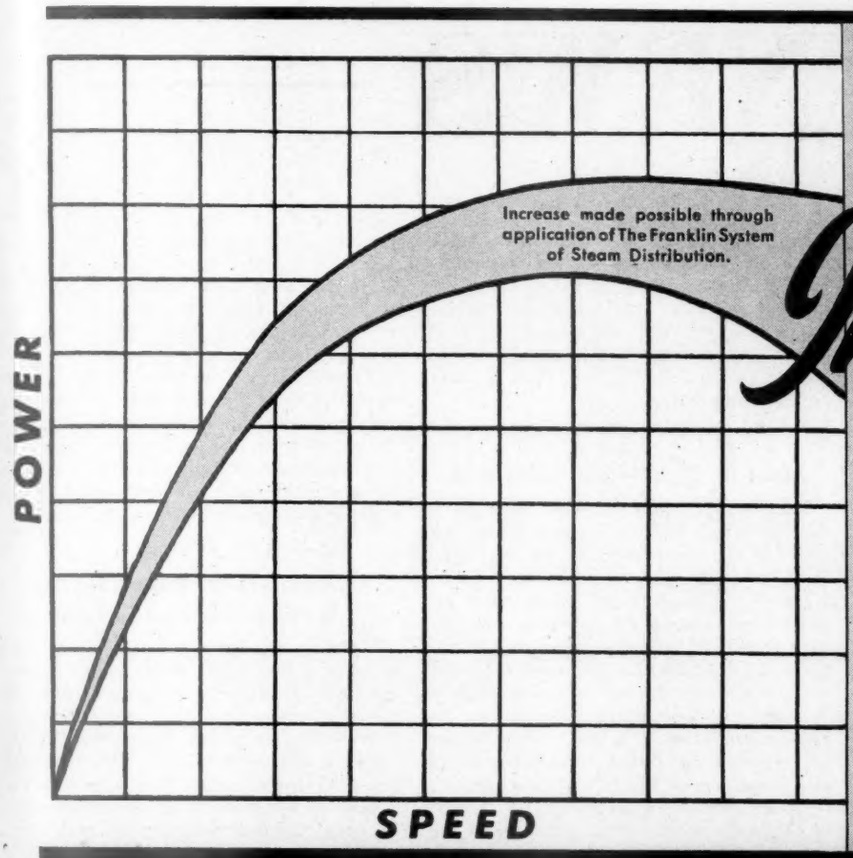

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IN THE "TRAIN LOAD-SPEED" CAPACITY OF THE STEAM LOCOMOTIVE

THE FRANKLIN SYSTEM OF Steam Distribution

Results in

★ MORE HORSEPOWER PER UNIT OF LOCOMOTIVE WEIGHT

★ MORE HORSEPOWER PER UNIT OF COAL AND WATER

★ MORE HORSEPOWER PER UNIT OF COST

It does this by releasing the latent power of the locomotive that was formerly locked up by the limitations of the piston valve, and the conventional valve gear.

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In Canada: FRANKLIN RAILWAY SUPPLY COMPANY, LIMITED, MONTREAL

NEWS

Enochs Named to Manpower Policy Committee

A MANAGEMENT-labor policy committee of the War Manpower Commission, to be composed of seven national labor leaders and seven leaders of war production and transportation management, has been set up by Commission Chairman Paul V. McNutt.

Representing railroad management is H. A. Enochs, chief of personnel of the Pennsylvania. In addition to Mr. Enochs, the committee will also include a representative of railroad labor, as well as three Congress of Industrial Organization and three American Federation of Labor officials, plus six industrial executives.

A. A. R. Names Manpower Committee to Work With ODT

A COMMITTEE of railroad executives has been named by the Association of American Railroads to work with the Office of Defense Transportation's Division of Transport Personnel on "methods of speeding up the process of recruiting and training new employees, and of improving railroad personnel policies.

The committee is headed by Dr. J. H. Parmelee, director of the A.A.R.'s Bureau of Railway Economics, and other members are as follows: H. A. DeButts, operating vice-president of the Southern; H. A. Enochs, chief of personnel, Pennsylvania; W. H. Flynn, general superintendent of motive power and rolling stock, New York Central; John P. Morris, general mechanical assistant, Atchison, Topeka & Sante Fe; J. B. Parrish, assistant vice-president, Chesapeake & Ohio; and C. R. Young, manager of personnel, Illinois Central.

The ODT announcement said that Director Eastman will ask management and labor groups in all branches of transportation coming under his direction to set up similar committees "as the need for them arises."

A-1-j Priorities for Repair and Maintenance Materials

THE War Production Board has amended Preference Rating Order No. P-88, raising from A-3 to A-1-j the preference rating available to railroads for deliveries of materials essential for repair and maintenance of track, structures, signal and communications systems, cars and locomotives and other facilities. The amendment specifies that the ratings under the order may be applied without further authority for installations in which the charge to capital account is not in excess of $500 for a single project.

Another provision of the amendment prohibits the application of a higher rating than A-1-j by suppliers to replenish inventories depleted as a result of deliveries made on A-1-a orders for emergency repairs. Among other modifications of the original order is one under which railroads may not only sell material to their own subsidiaries but also to lines "not owned but customarily maintained by them or their subsidiaries."

Most of 18,000 Cars Allocated

RELEASES have been reported for most of the 18,000 new freight cars which were authorized for construction by the War Production Board following its limitation order of April 4. These 18,000 cars, which are in addition to about 9,000 delivered in January and 36,000 authorized by the former Supply Priorities and Allocations Board for construction during the three months, February-April, inclusive, will complete the 1942 car-building program. Construction will immediately follow completion of the cars remaining in the SPAB program.

Breakdown of the final 18,000 by classes of cars authorized is reported to be as follows: 6,131 hopper cars; 5,016 gondola cars; 2,428 flat cars; 2,000 ore cars; 500 covered hopper cars; and 1,925 tank and special type cars. Of the 6,131 hopper cars, 3,396 will be of steel construction and 2,735 of composite wood and steel construction; of the 5,016 gondola cars, 1,616 will be steel and 3,400 composite.

The accompanying table shows the allocation of these 18,000 cars by railroads and builders based on releases reportedly made by the War Production Board's transportation equipment branch. Certain of the cars on which the matter of design and steel is still in question are listed as unallocated.

Committee to Supervise War Work in Railroad Shops

FORMATION of a committee of representatives of railroad management, railroad employees, and the government to supervise the performance of war production work in railroad shops has been announced by Director Eastman of the Office of Defense Transportation. The committee was named as the result of a recent agreement between railroad management and repre-

(*Continued on next left-hand page*)

Reported Allocation of Final 18,000 Freight Cars Authorized for 1942 Construction

Railroad	*No.*	*Type*	*Builder*
Atlantic Coast Line	300	Gondola	Bethlehem Steel Co.
	100	Flat	Greenville Steel Car
Bessemer & Lake Erie	93	Hopper	Pullman-Standard
	150	Gondola	Greenville Steel Car
	20	Gondola	Pressed Steel
Birmingham Southern	86	Gondola	Pullman-Standard
Central of New Jersey	246	Hopper	Company Shops
	500	Gondola	Bethlehem Steel Co.
Chesapeake & Ohio	130	Hopper	American Car & Foundry
Chicago & North Western	250	Flat	Pullman-Standard
	25	Flat	Company Shops
Chicago, Burlington & Quincy	250	Hopper	Company Shops
	400	Flat	Company Shops
Chicago, Milwaukee, St. Paul & Pacific	2	Flat	Company Shops
Chicago, Rock Island & Pacific	300	Flat	Company Shops
Delaware & Hudson	80	Hopper	Company Shops
Detroit, Toledo & Ironton	50	Flat	Greenville Steel Car
Duluth, Missabe & Iron Range	500	Ore	Pullman-Standard
	500	Ore	General American
	500	Ore	American Car & Foundry
Elgin, Joliet & Eastern	500	Gondola	American Car & Foundry
	200	Gondola	General American
	200	Flat	Ralston
Great Northern	500	Ore	Bethlehem Steel Co.
Louisville & Nashville	100	Flat	Mount Vernon Car
Lehigh Valley	960	Hopper	Bethlehem Steel Co.
Missouri Pacific	570	Gondola	Pressed Steel Car
New York Central	1,100	Gondola	Despatch Shops
	303	Flat	Despatch Shops
New York, Chicago & St. Louis	50	Flat	Pullman-Standard
New York, New Haven & Hartford	13	Flat	Company Shops
Norfolk & Western	200	Hopper	Virginia Bridge
Northern Pacific	489	Hopper	American Car & Foundry
Pennsylvania	797	Hopper	Company Shops
	1,000	Gondola	Company Shops
	22	Flat	Company Shops
Pere Marquette	250	Flat	Greenville Steel Car
Reading	300	Hopper	Company Shops
	300	Gondola	Company Shops
St. Louis Southwestern	50	Flat	Company Shops
Shippers Car Line	3	Flat	American Car & Foundry
Southern Pacific	90	Gondola	Company Shops
	10	Flat	Company Shops
Virginian	536	Hopper	Company Shops
	100	Gondola	Company Shops
Wabash	100	Gondola	Company Shops
Western Pacific	300	Flat	Mount Vernon Car
Unallocated	2,050	Hopper	
	500	Cov. Hopper	
	1,925	Tank & Special Type	
Total	18,000		

"Tailor Made"

YET STANDARDIZED!

Each Security Arch is "tailor made" to suit the individual class of power in which it must function. But so effectively is Security Arch Brick standardized that only six different Security Brick patterns are needed for more than 50% of the Security Arch Brick used.

This high standardization reflects the engineering and experience of the American Arch Company.

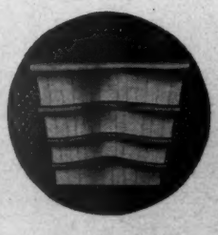
It simplifies the application of the brick arch and saves the stores department a vast amount of trouble.

This foresight of the American Arch Company in adhering to standards is but one of the many ways in which the American Arch Company is serving the railroads.

There's More to
SECURITY ARCHES
Than Just Brick

HARBISON-WALKER REFRACTORIES CO.

Refractory Specialists



AMERICAN ARCH CO.
INCORPORATED
60 EAST 42nd STREET, NEW YORK, N. Y.
Locomotive Combustion Specialists

Orders and Inquiries for New Equipment Placed Since the Closing of the June Issue

LOCOMOTIVE ORDERS

Road	No. of Locos.	Type of Locos.	Builder
Reading	4	1,000-hp. Diesel-elec.	Baldwin Loco. Wks.
	3	660-hp. Diesel-elec.	Baldwin Loco. Wks.
	3	1,000-hp. Diesel elec.	Electro-Motive Corp.

FREIGHT-CAR ORDERS

Road	No. of Cars	Type of Cars	Builder
Great Northern	500	75-ton ore	Bethlehem Steel Co.

FREIGHT-CAR INQUIRIES

Columbia Steel Co.	10	50-ton flat	.....
Republic Steel Corp.	20	50-ton twin hopper	.....
	15	70-ton triple hopper	.....

sentatives of shop craft and clerical employees to produce war materials in railroad shops under existing labor contracts.

Otto S. Beyer, director of the ODT's Division of Transport Personnel, heads the newly-formed committee. Other members are: George A. Landry, chief of the Staff Service Branch, Production Division, War Production Board; Andrew Stevenson, chief of the Transportation Branch, Division of Industry Operations, WPB; M. W. Clement, president of the Pennsylvania; W. M. Jeffers, president of the Union Pacific; Ernest E. Norris, president of the Southern; B. M. Jewell, president, Railway Employes' Department, American Federation of Labor; F. H. Knight, general president, Brotherhood of Railway Carmen of America; H. J. Carr, vice-president, International Association of Machinists. George M. Harrison, grand president of the Brotherhood of Railway Clerks, will serve as an alternate for one or the other labor members when there is a matter up which affects his organization.

WPB Transportation Branch Appointments

O. J. PARKS and Charles P. Whitehead have been appointed consultants to the Transportation Equipment Branch of the War Production Board. Mr. Parks, who will specialize in car building and conversion of car building plants, has been general superintendent of equipment for the General American Transportation Corporation. Mr. Whitehead, who will advise on problems arising in the manufacture and production of gasoline, steam, electric, and Diesel locomotives, has been vice-president in charge of sales, General Steel Castings Corp.

N. W. Univ. Opens Its Tech. Institute

ON June 15 and 16 the new Technological Institute of Northwestern University, at Evanston, Ill., was formally dedicated, bringing to fruition the dream of Walter P. Murphy, chairman of the Standard Railway Equipment Manufacturing Company, Chicago, whose gift of $6,735,000 in 1939 made possible the new engineering school which will feature co-operative engineering courses to promote industry and transportation through education.

Mr. Murphy, whose inventions have lead to numerous improvements in many fields, and especially in the construction of freight cars, had little formal education himself, but had a keen desire to establish an educational institution to help young men in the transportation and engineering fields. He was born at Pittsburgh, Pa., on January 26, 1873, and entered railway service at the age of 16, later becoming foreman of the Missouri Pacific shops at Coffeyville, Kan.

In 1898 he joined his father in the railway supply business at St. Louis, Mo. He later took out more than 40 patents designed to eliminate waste in construction or to strengthen and lengthen the life of railway equipment. In recent years he has been living in California. On his physician's orders, he was unable to attend the dedication of the new institution that will perpetuate his ideals, if not his name.

Walter P. Murphy

Mr. Murphy planned for many years to establish an institution which would combine theory and practice in engineering. For that reason the new institute will operate on the "co-operative plan," with the students alternating at study and employment in industry and transportation, gaining first-hand knowledge of the practical application of the principles studied in classrooms. Civil, mechanical, electrical and chemical engineering will be taught, and the curriculum for all courses will be based on a five-year period, including eleven quarters of laboratory and classroom instruction and seven quarters of employment in industry.

On the second day of the dedication ceremonies 15 honorary degrees were awarded to noted industrial, educational and governmental leaders, including the honorary degree of Doctor of Laws, granted in absentia to Walter P. Murphy.

Revised and Emergency Material Specifications

THE standardization and simplification of materials for railway use has been carefully considered by the various committees of the A. A. R. Mechanical Division with reference to the war emergency and the necessity of conservation of scarce materials. The material specifications of the division have been thoroughly reviewed by the Committee on Specifications for Materials and Committee on Wheels and in several cases in co-operation with groups of manufacturers and technical advisory committees of the War Production Board, according to a statement recently issued by Secretary A. C. Browning.

(*Continued on next left-hand page*)

A Factor that *Increases* BOILER CAPACITY

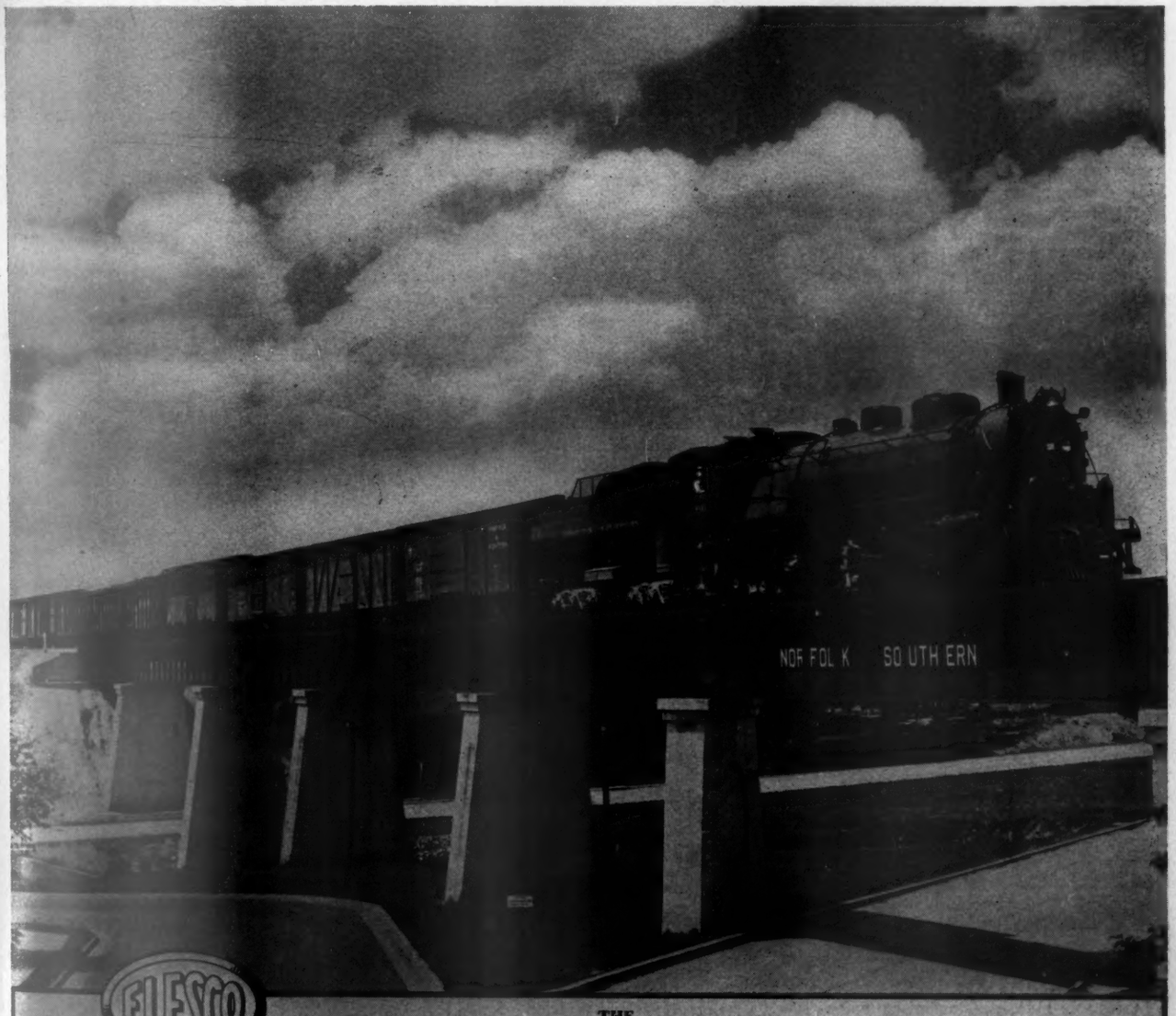
. . . The ELESCO EXHAUST STEAM INJECTOR

It increases the steaming capacity of a locomotive boiler 10%-15% by transferring high degrees of heat from exhaust steam to the feedwater.

The Elesco exhaust steam injector gives more heat recovery than any other type of feedwater heater per unit of weight and cost . . . apply it to your locomotives.

A-1485

This locomotive is equipped with an Elesco Exhaust Steam Injector



ELESCO

SUPERHEATERS • FEEDWATER HEATERS
AMERICAN THROTTLES • STEAM DRYERS
EXHAUST STEAM INJECTORS • PYROMETERS

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Montreal, Canada
THE SUPERHEATER COMPANY, LTD.

In some cases specifications have been completely reviewed; in other cases specifications have been reaffirmed; and in other cases emergency provisions have been provided to be effective during the war period and for a reasonable period thereafter. The revised and reaffirmed specifications have been printed on standard white loose-leaf pages to be inserted in the Manual of Standard and Recommended Practice. Emergency specifications and provisions have been printed on yellow pages to be inserted in the manual immediately preceding each present standard specification. The revised index to Sec. A of the Manual shows the 1942 revisions and emergency specifications to be followed during the war period as well as the present specification numbers. In some cases certain A. S. T. M. specifications are shown which are not reproduced for the Manual, as they are published and distributed by the American Society for Testing Materials, 260 South Broad Street, Philadelphia, Pa.

In addition, the A. A. R. General Committee urges that during the war period materials be ordered only to specifications of this association and those of other recognized national bodies, rather than to individual railroad specifications. The A. A. R. revised and emergency specifications can be secured from the secretary's office.

Supply Trade Notes

F. B. DAVIS has been appointed to manage sales of Aristoloy alloy steels and Coppco tool steels in the Buffalo, N. Y., district for the Copperweld Steel Company. Mr. Davis was previously connected with the Edgar T. Ward Company.

◆

AMERICAN BRAKE SHOE & FOUNDRY CO.—*John S. Hutchins,* district sales manager of the Ramapo Ajax Division of the American Brake Shoe & Foundry Co., with headquarters at Chicago, has been appointed sales manager in charge of all sales of this division, with the exception of those on the West Coast and at Pueblo, Colo., which will be under the jurisdiction of *H. W. Renick,* vice-president. Mr. Hutchins was born at Arlington, Mass., on December

J. S. Hutchins

30, 1904, and after attending Yale University entered the employ of Ramapo Ajax at Chicago in September, 1925. Two years later he was transferred from the plant to the sales department and in 1930 was transferred to the Cleveland office. In 1933 he was placed in charge of sales in the Chicago district, and in 1941, Mr. Hutchins became district sales manager in charge of the entire Middle West territory.

◆

JAMES S. HEARONS, assistant manager of sales of the railroad division of the Inland Steel Company, Chicago, has been given a leave of absence, effective June 8, to enable him to serve with the Production division of the War Production Board in Washington. Mr. Hearons will work in a consulting capacity as liaison between the railroads and the Board.

S. M. CLANCEY, central district sales agent for the P. & M Company, Chicago, has also been appointed representative of the Peerless Equipment Company, Chicago.

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THE H. K. PORTER COMPANY will open a plant in Blairsville, Pa., to expand its facilities for the war effort. It is anticipated that the plant will employ between 150 and 200 men when in full operation.

◆

ALFRED SONTAG has joined the staff of the testing machine department of the Baldwin Southwark division of the Baldwin Locomotive Works, Philadelphia, Pa. Mr. Sontag was chief engineer and sales manager of the Riehle testing machine division of American Machine and Metals.

◆

JOHN W. WILEY, formerly with the Hyatt Bearings division of the General Motors Corporation, is now associated with the Koppers Company, American Hammered Piston Ring division, on the sale and service of that division's products for the railroads. He will make his headquarters at the company's New York office.

◆

MINNEAPOLIS-HONEYWELL REGULATOR COMPANY.—*Fred Kaiser,* for the past three and one-half years branch manager at Detroit, Mich., for the Minneapolis-Honeywell Regulator Company, has been appointed Chicago branch manager to replace *Charles L. Saunders,* who recently resigned to join the War Production Board at Washington, D. C., as chief of the instrument section in the machinery division. *D. J. Peterson,* branch manager at Buffalo, N. Y., will succeed Mr. Kaiser at Detroit, and *Herman Seelbach, Jr.,* who has been attached to the air conditioning division at Buffalo, will succeed Mr. Peterson in that city.

Navy "E" Award

THE Navy "E" burgee was awarded The National Bearing Metals Corporation, St. Louis, Mo., on May 14, and the Bartlett Hayward division of the Koppers Company, Pittsburgh, Pa., on June 13. The American Locomotive Company, Schenectady, N. Y., which was awarded the Navy "E" last November 18, continues to fly the pennant, a six months' renewal of the privilege having been made by the Navy Board of Awards beginning April 24.

FRED S. DORAN has been elected vice-president of Joseph T. Ryerson & Son, Inc. Mr. Doran has under his direction purchases for all ten Ryerson plants, and other responsibilities in connection with the Ryerson war effort.

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THE CUMMINS DIESEL ENGINE CORPORATION of New York has announced the change in its corporate name to the Rogers Diesel & Aircraft Corporation. The offices and plant of the corporation will be located as formerly at 1120 Leggett avenue, New York.

◆

ARTHUR WILLIAMS has been appointed chief engineer of the Superheater Company. Mr. Williams was born in Swindon, England, in 1904, and received his technical education at Swindon college. Mr. Williams served a special apprenticeship with the Great Western Railway of England from 1921 to 1926. He came to America in October, 1926, to join the Franklin Railway Supply Company, and in April, 1927, became associated with the Lima Locomotive Works. In the latter part of

Arthur Williams

1927 he joined the Superheater Company's engineering department. He was appointed research engineer in 1930; assistant chief engineer in 1938, and manager of the production engineering division in 1939. Mr. Williams is the author of a number of papers on heat transfer which he presented before the A. S. M. E. and railway clubs. He is a member of the A. S. M. E. and an associated member of the Institution of Mechanical Engineers (London).

(*Turn to next left-hand page*)

How to hit a Bomber

Seven miles up!

THE punishment that American-built Flying Fortresses, soaring at stratosphere levels, have been able to deal out with comparative impunity has shown the world that anti-aircraft fire must now reach a ceiling of 36,000 feet or better to be effective.

Do you realize what it means to throw a shell accurately to these terrific heights? It not only requires a tremendously powerful weapon but it means that the quality of the steel in the shell must be beyond question. For unless the shell can safely absorb the very high propellent charge, it will mushroom in the barrel and destroy the gun, endangering the gun crew as well.

Here's a really tough job that has been put up to the shell maker and the steel producer. NATIONAL Tube engineers and metallurgists have helped to solve it quickly and satisfactorily.

Drawing on their long experience in producing high quality steel tubes for high-pressure boilers, gasoline cracking units and similar high-pressure industrial equipment, our steel experts have successfully produced, in enormous quantities, special shell steel to meet the exacting requirements of high-range anti-aircraft shells.

Anti-aircraft shells, however, are only one of many war items made by NATIONAL Tube Company. Long years of experience in producing tubular products involving special manufacturing and heat-treating procedures have enabled the NATIONAL organization to produce many other items of vital importance to the whole War Program.

NATIONAL TUBE COMPANY

Pittsburgh, Pa.

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

UNITED STATES STEEL

Our Part in the Victory Program

The following partial list of finished and semi-finished articles indicates the extent and character of our participation in America's war effort.

- Demolition Bombs
- Shell Forgings
- Finished Shells
- Aircraft Tubing
- Axle Housings
- Machine Gun Casing
- Hydrogen Cylinders
- Oxygen Cylinders
- Air Flasks
- Fuel Lines
- Water Lines
- Pipe and Tubing for:
- Smoke Shells
- Trench Mortars
- Gun Mounts—small
- Cannon Mounts
- Rifle Parts
- Range Finders
- Searchlight Mounts
- Submarine Detectors
- Fuselage
- Landing Gear
- Spar Chords
- Tank Parts
- Truck Parts
- Army Cots
- Cantonments
- Arsenals
- Powder Plants
- Battleships
- Destroyers
- Submarines
- Anti-aircraft Gun Parts

ATIONAL · · AMERICA'S PREFERRED SEAMLESS PIPE

THE GISHOLT MACHINE COMPANY, Madison, Wis., has established a branch office at 1124 Park building, Pittsburgh, Pa., in order to be of greater service to its customers. *W. L. Sutherland* is in charge of this office and handles negotiations for the complete line of Gisholt turret lathes, automatic lathes and balancing machines in the Southeastern Ohio, West Virginia, Western Pennsylvania, and Western Maryland areas.

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HERSCHEL E. POST, manager of the Houston, Texas, paint factory of the Pittsburgh Plate Glass Company, has been appointed general sales manager of industrial finishes, with headquarters at Pittsburgh, Pa.

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ALLEGHENY LUDLUM STEEL CORPORATION.—*H. N. Arbuthnot*, district manager of the Detroit, Mich., office of the Allegheny Ludlum Steel Corporation, has been promoted to the position of assistant general sales manager, with headquarters at Pittsburgh, Pa. *J. D. McKnight* has been named manager of the Detroit, Mich., district sales office. Mr. McKnight was formerly assistant manager in Detroit and has been associated with Allegheny-Ludlum for the past six years. *E. E. Sanborn* has been appointed manager of tool steel sales in Cleveland, Ohio, territory.

◆

W. H. HOLCOMB, formerly vice-president and general manager of the Pelton Water Wheel Company, San Francisco, Calif., has been appointed assistant to the executive vice-president of the Baldwin Locomotive Works. Mr. Holcomb started with the Pelton Water Wheel Company, a subsidiary of the Baldwin Locomotive Works, in December, 1919, as sales engineer. Later, he became manager of the

W. H. Holcomb

pump department, sales manager, vice-president and sales manager and, since June, 1939, vice-president and general manager. Before joining the Pelton company, he was with the Southern Pacific and the Pacific Telephone & Telegraph Co. in California.

◆

WALTER SMITH has been appointed western manager of the Pilliod Company with offices in Chicago, to succeed Frank Fisher, who has retired after 21 years of service. Mr. Smith was formerly manager of the western railroad division of the Vanadium Corporation of America. He was graduated from Cornell University with a degree in mechanical engineering in 1909 and entered railway service in that same year as a special apprentice on the Baltimore & Ohio at Newark, Ohio. He subsequently

Walter Smith

served in various supervisory capacities on the B. & O. and on the Chicago & North Western, and from 1913 to 1916, was inspector of locomotives built for the C. & N. W. at Schenectady, N. Y. He joined the Pyle-National Company in 1916, leaving in 1918 to serve as a first lieutenant with the 19th Railroad Engineers in France. He resumed work with the Pyle-National Company in August, 1919, continuing as a special representative until 1930 when he joined the Vanadium Corporation of America as assistant manager of the railroad division. He was appointed manager of the western railroad division of that company in 1932 and held that position until his new appointment.

◆

WILLIAM M. BLACK, president of the American Manganese Steel Division of the American Brake Shoe & Foundry Co., Chicago Heights, Ill., has been elected also

William M. Black

a vice-president of the American Brake Shoe & Foundry Co., New York. Mr. Black joined this division in 1912 and became its general sales manager in 1934 and vice-president in 1935. He was elected president in 1940 and will continue in that capacity. He served as a lieutenant of ordnance in World War I.

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CHARLES H. MCCREA, manager of the Cleveland, Ohio, works of the National Malleable & Steel Castings Co., has been elected first vice-president and a member of the board of directors.

Obituary

HOBART S. JOHNSON, chairman of the board of directors of the Gisholt Machine Company, Madison, Wis., died on May 28 after a long illness. Mr. Johnson was born in Madison, Wis., on October 7, 1873, and studied mechanical engineering at the University of Wisconsin from 1890 to 1893 when he left the university to take charge of the Gisholt Machine Company machine tool exhibit at the World's Columbian exposition in Chicago. At the close of the exposition he entered the Gisholt shops and in 1897 became shop superintendent and

Hobart S. Johnson

works manager, a position he held for several years. Later he advanced to the vice-presidency, and, upon the death of his brother Carl in 1931, became president of the company. Because of failing health, he resigned from the latter position in 1940 and was succeeded by his son, George H. Johnson.

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EUGENE W. RICHEY, western sales representative of the New York Air Brake Company, with headquarters in Chicago, died in the Passavant hospital in that city on May 28.

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WALTER S. ADAMS, who, prior to his retirement on April 1, 1941, had been connected with the J. G. Brill Company continuously for 56 years, died suddenly on May 27. He was 80 years of age. Mr. Adams started with the Brill Company as a draftsman in the engineering department, becoming chief draftsman in the early 1900's, and later designing engineer. He was personally responsible for important developments in street railway cars and car trucks, and more than 150 patents were granted on his inventions covering transportation equipment and associated products. In recent years he was engineer of patents for the Brill Company, investigating new designs and following patent matters.

(Turn to fifth right-hand page)

PIERRE G. JENKS, president of the Pullman-Standard Car Export Company, and a director of the Pullman-Standard Car

Pierre G. Jenks

Manufacturing Company, who died on June 14, began his business career as a stenographer with the Pressed Steel Car Company on its formation in 1899. He was elected treasurer of that company in 1903. He subsequently was associated with the Banning Cooper Company and in 1913 joined the Standard Steel Car Company as manager of its Hammond, Ind., plant. He was elected vice-president in 1922 and in the merger with Pullman, Inc., in 1930, became president of the Pullman-Standard Car Export Company in charge of all foreign operations. Mr. Jenks served in the Spanish-American War and, in World War I, as a major in the field artillery. He was 66 years of age.

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HENRY C. STIFF, retired superintendent of engineering of the Lorain division, Carnegie-Illinois Steel Corporation, Johnstown, Pa., died on May 22. He was 71 years of age.

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DAVID VAN ALSTYNE, at one time superintendent motive power of the Chicago Great Western and mechanical superintendent of the Northern Pacific, and later a vice-president of the American Locomotive Company, died of an acute heart attack at Wilton, N. H., on June 7. Mr. Van Alstyne was born at Louisville, Ky., July 14, 1865, and was graduated from the Massachusetts Institute of Technology in 1886. He entered the service of the Louisville & Nashville as a machinist apprentice, remaining with that company for eight years as a machinist, locomotive fireman, and enginehouse foreman. He engaged in the foundry business for three and a half years and then served for a year as master mechanic on the Louisville, Henderson & St. Louis. He was head of the mechanical department of the Chicago Great Western from 1899 to May 26, 1904, when he became mechanical superintendent of the Northern Pacific. Mr. Van Alstyne was appointed vice-president in charge of manufacture of the American Locomotive Company in 1907. From 1910 to July, 1917, he was engaged in a consulting capacity by several organizations, including the New York, New Haven & Hartford, of which he was appointed assistant to the vice-president in September, 1914. In 1917 he returned to the American Locomotive Company, serving in various capacities until his retirement on September 1, 1930. He has since lived at Wilton, N. H.

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EDWARD M. SMITH, assistant sales manager of the Electro-Motive Division of

Edward M. Smith

General Motors Corporation, LaGrange, Ill., died in that city on June 18. He was born in Susquehanna, Pa., on January 22, 1890, and after graduating from Laurel Hill Academy, Susquehanna, in 1907, entered railway service as an office clerk on the Erie. He was transferred to New York and later was promoted to special representative at Youngstown. In 1935 he resigned to become assistant sales manager of Electro-Motive.

Personal Mention

General

J. A. E. PATRY has been appointed rule and mechanical instructor, Quebec district, on the Canadian National, with headquarters at Joffre, Que.

CARL HEATON, chief clerk to the superintendent of motive power of the New York, Chicago & St. Louis (Nickel Plate), has been promoted to assistant to the superintendent of motive power, with headquarters as before at Cleveland, Ohio.

C. F. DENO, district master mechanic of the Manitoba district of the Canadian Pacific with headquarters at Winnipeg, Man., has been promoted to assistant superintendent of motive power, Western lines, with headquarters as before at Winnipeg. It was incorrectly stated in the June issue that Mr. Deno had been appointed chief of motive power for Western Canada.

TRACY CLARK BALDWIN, superintendent of motive power of the New York, Chicago & St. Louis with headquarters at Cleveland, Ohio, retired from active service on May 31. Mr. Baldwin was born at East Springfield, Pa., on June 15, 1875, and entered railway service in June, 1889, as a messenger and tool room boy for the Nickel Plate at Conneaut, Ohio. He later served as machinist apprentice, machinist and toolmaker, and machine shop foreman at that point. In May, 1905, he was appointed enginehouse foreman at Buffalo, N. Y., and five years later, he was advanced to general machine shop foreman at Conneaut. Mr. Baldwin was promoted to master mechanic of the Buffalo and Cleveland divisions, with the same headquarters in April, 1915, and in November, 1916, he was advanced to superintendent of shops at Conneaut. In February, 1923, he was appointed master mechanic of the Chicago and Ft. Wayne divisions at Stony Island, Ill., and on June 10, 1929, he was transferred to the Nickel Plate district, with headquarters at Conneaut. Mr. Baldwin was promoted to superintendent of motive power, with headquarters at Cleveland, Ohio, on December 1, 1937.

T. C. SHORTT, master mechanic of the Nickel Plate district of the New York, Chicago & St. Louis, with headquarters at Conneaut, Ohio, has been appointed to superintendent of motive power, with headquarters at Cleveland, Ohio. Mr. Shortt was born at Crewe, Va., on December 9, 1888, and entered railway service as an apprentice on the Norfolk & Western at Crewe. From 1911 to 1914, he served as a machinist on the Atlantic Coast Line, the Norfolk & Southern and the Norfolk & Western. In 1914 he went with the Seaboard Air Line as a roundhouse foreman and in November, 1915, he returned to the Norfolk & Western as machinist and assistant foreman at Petersburg, Va. Mr. Shortt was promoted to roundhouse foreman at Portsmouth, Ohio, in 1920, and in November, 1923, he went with the Chesapeake & Ohio as machinist at Peach Creek, W. Va., later being advanced to foreman. He was transferred to Huntington, W. Va., in February, 1924, and appointed erecting shop foreman at Russell, Ky, on December 28, 1924. On June 1, 1930, he was appointed chief inspector at Lima, Ohio, and six months later he returned to Russell as erecting shop foreman. Mr. Shortt was appointed supervisor of reclamation, with headquarters at Huntington, on October 1, 1931, and a year later, he was appointed equipment inspector at Cleveland, Ohio. On July 16, 1933, he went with the Nickel Plate as assistant to the superintendent of motive power, with headquarters at Cleveland, and on December 1, 1937, he was appointed master mechanic of the Nickel Plate district, with headquarters at Conneaut, Ohio.

(*Turn to next page*)

Master Mechanics and Road Foremen

A. L. PLETTE, foreman on the Grand Rapids division of the Pennsylvania, has been appointed master mechanic of the western Pennsylvania division.

HARRY L. SCHEELER has been appointed assistant road foreman of engines of the Chesapeake & Ohio, with headquarters at Columbus, Ohio.

J. P. KELLY, works manager of the Ogden shops of the Canadian Pacific at Calgary, Alta., has been appointed master mechanic of the British Columbia district, with headquarters at Vancouver, B. C.

H. G. NOWELL, master mechanic on the Canadian Pacific, British Columbia district, at Vancouver, B. C., has been transferred to the Saskatchewan district, with headquarters at Moose Jew, Sask.

BARRY GLEN, general shop and enginehouse foreman on the Chicago, Milwaukee, St. Paul & Pacific at Miles City, Mont., who has been appointed division master mechanic at Miles City, as noted in the June issue, was born on December 3, 1892, at Tacoma, Wash. After graduating from high school in Tacoma, Mr. Glen entered

Barry Glen

the service of the C. M. St. P. & P. on September 5, 1911, as a machinist apprentice. In October, 1915, he became a machinist at Tacoma; in May, 1919, enginehouse foreman at Cle Elum, Wash., and again a machinist at Tacoma in October, 1919. In December, 1922, he was appointed general shop and enginehouse foreman at Miles City. Mr. Glen was at the Baldwin Locomotive Works from March, 1922, to November, 1922, as an inspector of new power for the Milwaukee.

Car Department

C. E. BARRETT has been appointed general car foreman of the Chicago, Milwaukee, St. Paul & Pacific at Minneapolis, Minn.

A. O. TAYLOR, gang foreman of the Renovo division of the Pennsylvania, has been appointed foreman of the Wheatland enginehouse and car shop at Wheatland, Pa.

E. BUCHHOLTZ, general car foreman of the Chicago, Milwaukee, St. Paul & Pacific at Minneapolis, Minn., has been transferred to Chicago.

A. C. SCHROEDER, general car department supervisor, Northern district of the Chicago, Milwaukee, St. Paul & Pacific, at Minneapolis, Minn., has been transferred to the Southern district, with headquarters at Chicago.

T. E. ANDERSON, general foreman of the car department of the Texas & Pacific at Marshall, Tex., has been appointed general car inspector, with headquarters at Dallas, Tex., temporarily in place of J. D. Clyde, Sr.

H. L. EWING, general car foreman of the Chicago, Milwaukee, St. Paul & Pacific at Chicago, has become general car department supervisor, Northern district, with headquarters at Minneapolis, Minn.

F. J. SWANSON, general car department supervisor, Southern district of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago has been granted a leave of absence to enter military service.

Shop and Enginehouse

C. B. CAMP, erecting shop foreman on the Texas & Pacific with headquarters at Marshall, Tex., has been appointed general foreman at Dallas.

H. C. VINSANT, master mechanic on the Texas & Pacific at Marshall, Tex., has been appointed shop superintendent at Ft. Worth, Tex.

A. C. MALONE, general foreman of the Hayne car shops of the Southern at Spartanburg, S. C., has been appointed superintendent of these shops, succeeding W. A. Harmon, deceased.

F. O. FERNSTROM, shop superintendent of the Chicago, Milwaukee, St. Paul & Pacific at Minneapolis, Minn., has been transferred to the shops at Milwaukee, Wis., succeeding H. R. Abrahart, resigned.

H. E. RICCIUS, master mechanic of the Trans-Missouri division of the Chicago, Milwaukee, St. Paul & Pacific at Miles City, Mont., has been appointed shop superintendent, with headquarters at Minneapolis, Minn. His jurisdiction will include also the Twin City terminals and the Duluth division.

Notice!

Some of our friends among railroad men and those of affiliated interests, whose careers are outlined in "Who's Who in Railroading" (biographical volume issued by the Simmons-Boardman Publishing Corporation, publishers of the *Railway Mechanical Engineer*), have informed us that they have been circularized by a clipping bureau in New York, offering them a copy of what "Who's Who in Railroading" reports of their careers, at a price of $1.

This clipping bureau is in no way connected with the Simmons-Boardman Publishing Corporation. We make this statement because we have received a number of communications from our friends inquiring about the solicitation.

Purchasing and Stores

A. B. SEARS, general foreman of the stores department of the Atchison, Topeka & Santa Fe at Topeka, Kans., has become assistant general storekeeper at Topeka.

CLIFFORD G. ALLEN, purchasing agent of the Akron, Canton & Youngstown and the Northern Ohio, with headquarters at Akron, Ohio, has been promoted to chief purchases and stores officer, a change of title.

Obituary

G. B. USHERWOOD, supervisor of boilers of the New York Central System, with headquarters at Albany, New York, died in Albany on June 29.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

EVERLASTING VALVES FOR BOILER ROOM SERVICE.—Everlasting Valve Co., Jersey City, N. J. A 32-page descriptive catalogue of quick-operating valves for blow-off, water column and other boiler room service. Ask for Bulletin E-100.

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CARBIDE TOOLS.—McKenna Metals Co., 1000 Lloyd avenue, Latrobe, Pa. Forty-eight page booklet. Instructions, with illustrations, on selecting, designing, using, brazing, and grinding Kennametal steel-cutting carbide tools.

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FEEDWATER HEATING EQUIPMENT.—Worthington Pump & Machinery Corporation, Harrison, N. J. Bulletin W-220-M5 showing representative installations of Worthington open type locomotive feedwater heating equipment on new power during 1939, 1940, and 1941.

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RUBBER CONSERVATION.—United States Rubber Company, Rockefeller Center, New York. Forty-eight page illustrated book, "First Aid to Industry in Conserving Rubber." Explicit suggestions given for the proper care of rubber products from their initial design through inventory and storage to use, maintenance, inspection and repair.

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WALL CARDS ON CARE OF RUBBER HOSE.—The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J. Two 8¾-in. by 11-in. cards with eyelet for hanging—one devoted to the proper care of fire hose; the other to rules for the proper care of air, water, steam and other types of rubber hose and for proper attaching of couplings.